ARCTEC CANADA LIMITED

ARCTIC TECHNOLOGY

Design, research and consulting in the fields of Cold Region
Marine Engineering, Ice Technology, Naval Architecture and Hydraulics

CA1
DTC 801
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c.2

ARCTEC CANADA LIMITED

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TP 3634

"MV ARCTIC"

1981 LATE SEASON DATA COLLECTION AND INSTRUMENTATION

VOLUME II - APPENDICES

25 March 1982

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17. Abstract

This is the report of the operation of the M.V. ARCTIC data acquisition system during the latter part of the 1981 data collection season. During the period, system maintenance levels continued to be high. Principal problems were computer losses due to overheating and failed integrated circuit boards. Gauge drift and video camera problems also were of importance.

A large quantity of data was collected, much of it in heavy ice conditions. Preliminary analysis of this data concentrated on more significant ice interactions, and a new approach to presenting trends in statistical data is presented. A number of sampling patterns were tried and are compared.

A section of the report describes the interpretation of the data. Suggestions for techniques to validate data during further analysis are made. A comparison with analogue signals is made. Results indicate that local hull stress levels while backing and ramming in multi-year ice are high - exceeding yield in some instances, 2 and 3 times those during transit operations in heavy ice, and up to 6 times greater than those experienced while transiting level 1st year ice. It is noted that following in the track of an icebreaker also gives rise to high loading.

A system operator's maintenance and trouble shooting guide has been compiled for use should further data collection be pursued, but the authors recommend this not take place with the current data acquisition system, but only after the value of data collected to date has been assessed.

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17. Résumé

Cet ouvrage traite des activités reliées au mécanisme d'acquisition de données du navire M.V. ARCTIC au cours de l'exercice saisonnier 1981.

Le niveau d'entretien du système a continué d'être élevé durant ce temps. La surchauffe et la défectuosité des modules à circuits intégrés ont été la source prédominante de problèmes, quoique la fluctuation des cellules de mesure de déformation et le bris de caméras vidéo furent des entraves non moins sérieuses.

Un grand nombre de données ont été recueillies dont une quantité importante a été enregistrée lors de conditions sévères des glaces. Les aspects les plus révélateurs des réactions coque et glaces ont fait l'objet principal de la première analyse. Une nouvelle technique pour l'identification de la tendance des résultats statistiques y est introduite. Un certain nombre de modèles d'échantillonnage a été essayé et comparé.

Dans un autre chapitre, on traite de l'interprétation des données et l'on suggère des techniques de validation par utilisation d'analyses subséquentes. On y fait aussi l'analyse comparative de données produites par signal continu.

Les résultats enregistrés indiquent que lorsque le navire a dû éperonner à répétition des banquises vieilles de plusieurs années, les bordées furent soumises à des efforts locaux très élevés souvent même, au-delà de la limite d'élasticité. On a constaté que le niveau des efforts pouvait atteindre jusqu'à six fois la valeur moyenne observée au cours du bris de glaces saisonnières de première année. On a aussi relevé de très grandes contraintes locales en suivant un brise-glace dans son sillon.

Un guide de l'opérateur pour l'entretien et le dépannage a été rédigé advenant la nécessité de collecter des données supplémentaires. Cependant, cet organisme ne conseille pas d'utiliser le présent système pour acquérir plus de données tant qu'on n'aura pas fini d'évaluer et de juger la valeur du matériel déjà recueilli.

18. Mots-clés	19. Diffusion
Navires - Exploitation par temps froid, Performance du navire, Essais de navire, Brise-glace, Navigation dans les glaces	Nombre limité d'exemplaires disponibles au CDT

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NOTE: SEPARATELY BOUND - COMPUTER PROGRAM OUTPUTS

APPENDIX A

VOYAGE LOG SHEETS

The attached sheets are copies of the daily log completed by the operator onboard. They provide data on daily ship's position, environmental conditions, and recordings made. They are reproduced as written.

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 1

DATE Sept 06, 1981

DAY 1

GMT

POSN AT 0000 Nanasivik °N Dock °W

POSN AT 0600 ____ °N ____ °W

POSN AT 1200 ____ °N ____ °W

POSN AT 1800 ____ °N ____ °W

POSN AT 2400 ____ °N ____ °W

ARCTEC PERSONNEL ABOARD

1. M. Steele
2. ____
3. ____
4. ____
5. ____
6. ____

NAUTICAL MILES STEAMED THIS DAY ____

HOURS STEAMED THIS DAY 1 hr

FUEL CONSUMED THIS DAY ____

HOURS OF RECORDING THIS DAY 37 min
Tape 01

WEATHER AT NOON

AIR TEMP ____ °C

DWPT TEMP ____ °C

WIND SPEED ____ Knots

WIND DIR ____ °T

REMARKS:

TESTS CONDUCTED: Zero's, Prop pitch change, leaving Nanasivik

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page 2

DATE Sept-07, 1981

DAY 2

GMT

POSN AT 0000 73° 15' °N 85° 15' °W

POSN AT 0600 73° 50' °N 80° 20' °W

POSN AT ~~1200~~ 1105 73° 40' °N 75° 30 °W

POSN AT 1800 72° 25 °N 70° 35 °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP +4.5 °C

DWPT TEMP _____ °C

WIND SPEED F3 Knots

WIND DIR _____ °T

REMARKS:

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 3

DATE Sept 08, 1981

DAY 3

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 68° 08' °N 59° 19 °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. M. Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED F4 Knots

WIND DIR _____ °T

REMARKS:

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page 4

DATE Sept - 04, 198

DAY 4

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS:

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED

1340

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page 5

DATE Sept 10, 1981

DAY 5

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 59° 19' °N 47° 57' °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 35 Knots

WIND DIR 010°R °T
ship Hd 113°

REMARKS:

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 6

DATE Sept - 11, 1981

DAY 6

POSN AT 0000 ~~58° 31'~~ °N 36° 05' °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 58° 31' °N 36° 05' °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC PERSONNEL ABOARD

1. M steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 5-25 Knots

WIND DIR _____ °T

REMARKS: ship hd 89 °
wind Dir 260-010 °R

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 7

DATE Sept 12, 1981

DAY 7

POSN AT 0000 ____ °N ____ °W

POSN AT 0600 ____ °N ____ °W

POSN AT 1200 58° 24' °N 27° 32 °W

POSN AT 1800 ____ °N ____ °W

POSN AT 2400 ____ °N ____ °W

NAUTICAL MILES STEAMED THIS DAY ____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY ____

HOURS OF RECORDING THIS DAY 0

TESTS CONDUCTED:

ARCTEC PERSONNEL ABOARD

1. M Steele
2. ____
3. ____
4. ____
5. ____
6. ____

WEATHER AT NOON

AIR TEMP ____ °C

DWPT TEMP ____ °C

WIND SPEED 20-40 Knots

WIND DIR 324 °T

REMARKS: wind 220 - 250°R
ship hd 850

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 8

DATE Sept-13, 1981

DAY 8

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 58° 37' °N 15° 43' °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY 0

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 16 Knots

WIND DIR 114 °T

REMARKS:

wind dir 025 ° R

ship Hd 89°

ship spd 16 kn

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 9

DATE Sept - 14, 1981

DAY 9

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 58° 42' °N 06° 8' °W

POSN AT 1200 58° 36 °N 02°55 °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY 0

TESTS CONDUCTED:

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT ~~NOON~~ 13:30 GMT

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 25-40 Knots

WIND DIR 127-147 °T

REMARKS:

wind Dir 340-360 °T

ship head 147°

ship spd 16 KN

PROBLEMS ENCOUNTERED:

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 10

DATE sept -15, 1981

DAY 10

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 54° 37' °N 1° 16' °W E

POSN AT 1200 53° 21' °N 2° 56' °W E

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC PERSONNEL ABOARD

1. M. Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP 15 °C

DWPT TEMP _____ °C

WIND SPEED 42 Knots

WIND DIR 152 °T

REMARKS:

wind Dir 010 °R

ship Hd 142 °

ship Spd 15.6 Kn

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 11

DATE Sept-16, 1981

DAY 11

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 5

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

Antwerp dock 05:00 GMT

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC PERSONNEL ABOARD

1. M. Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 12

DATE Sept -15, 1981

DAY 13

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 51° 52' °N 3° 19 °W E

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 Amsterdam °N Drydock °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY 16

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS:

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 13

DATE Sept - 26, 1981

DAY 21

POSN AT 0000 Amsterdam °N Drydock °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 53° 11' °N 3° 12' °E

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 19 1/2

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

Draft 24'A, 20.5'F

TESTS CONDUCTED:

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP 10 °C

DWPT TEMP _____ °C

WIND SPEED 32 Knots

WIND DIR 168 °T

REMARKS:

wind Dir 215° R

Ship Head 313°

Ship Spd 16.2

Seas - Astern Light - Moderate overcast

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page 14

DATE Sept-27, 1981

DAY 22

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 58° 39' °N 2° 57 °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC PERSONNEL ABOARD

1. M. Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 22 Knots

WIND DIR 105 °T

REMARKS:

wind 135 °R

ship Head 330°

ship Spd 15.3 ~~22~~ kn

Seas - moderate

Roll - light-moderate

Partly Sunny

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page 15

DATE Sept 28, 1981

DAY 23

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 58° 45 °N 15° 13 °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

ARCTEC PERSONNEL ABOARD

1. M. Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 43 Knots

WIND DIR 317 °T

REMARKS:

wind dir 045 °R

ship head 272

ship spd 14.9 kn

Seas Mod -> Heavy

Roll Same

PROBLEMS ENCOUNTERED:

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 16

DATE Sept 29, 1981

DAY 24

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 58°56' °N 27 37 °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC PERSONNEL ABOARD

1. M. Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 17 Knots

WIND DIR 306 °T

REMARKS:

wind dir 035 °R

ship head 271

ship spd 15.6 Kn

seas : Light

Roll : Light

Overcast

ARCTEC CANADA LIMITED

7340

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page 17

DATE Sept 30, 1981

DAY 25

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 59° 02 °N 40° 05 °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 3 Knots

WIND DIR 015 °T

REMARKS:

wind Dir 286 °R

ship Hd 271

ship Spd 16.1

Seas : Light

Roll -1°

Overcast

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page 19

DATE Oct 1, 1981

DAY 26

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 61° 42' °N 51° 19 °W

POSN AT 1800 63° 08' °N 53° 15 °W

POSN AT 2400 64° 36' °N 54° 38 °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 24

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

First Bergs sighted 16:00Z

PROBLEMS ENCOUNTERED:

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 12 Knots

WIND DIR _____ °T

REMARKS:

wind dir 075 °R

ship hd 328°

ship spd 16.1 Kn

Seas Light

Roll Light

Sunny

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 19

DATE Oct 2, 1981

DAY 27

POSN AT 0000 64° 36' °N 54°38' °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 67° 28 °N 58° 26 °W

POSN AT 1800 68° 10' °N 59° 56 °W

POSN AT 2400 68° 43' °N 61° 15' °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 23

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

Engine dies when ship slows
stopped 12:45 → 13:45

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON GMT

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 15 Knots

WIND DIR _____ °T

REMARKS:

wind dir 270-320 °R

ship hd 315°

ship spd 15.9

sea s calm

Roll none

FOG

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 20

DATE Oct 3, 1981

DAY 28

POSN AT 0000 68° 43' °N 61° 18' °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 70° 30 °N 66° 14' °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 70° 36' °N 66° 03 °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 10h 10m

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

Siezed a Piston Stopped 10:10

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON GMT

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 2 Knots

WIND DIR _____ °T

REMARKS:

wind dir 055 °R

ship Hd 317

ship Spd 0

Seas Calm

Roll Light

Sunny

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 21

DATE Oct 4, 1981

DAY 29

POSN AT 0000 70° 36' °N 66° 03 °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 70° 37' °N 66° 11' °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 70° 40' °N 66° 23' °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 0 Goddamnit

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

Engine still under repair

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON GMT

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 1 km Knots

WIND DIR _____ °T

REMARKS:

wind dir 80 °R

ship's head 20°

ship's speed 0

Seas Calm

Roll slight

Slight Fog

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page 22

DATE Oct 5, 1981

DAY 30

POSN AT 0000 70° 40' °N 66' 23' °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 70° 48' °N 66° 41' °W

POSN AT 1800 70° 53' °N 66° 56' °W

POSN AT 2400 70° 55' °N 67° 00' °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 1 1/4

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

Ran from 06:45 to 07:25

then stopped

start 13:20, stop 13:20

start 23:0[illegible] stop 23:20

start 23:[illegible] stop 23:[illegible]

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON GMT

AIR TEMP -2 °C

DWPT TEMP _____ °C

WIND SPEED 10 Knots

WIND DIR _____ °T

REMARKS:

wind dir 65 °R

ship head 140°

ship spd 0

seas calm

Roll none

Fog

ARCTEC CANADA LIMITED

MV ARCTIC - 1981

LOG OF ACTIVITIES

DATE Oct 6, 1981

DAY 31

POSN AT 0000 70° 55' °N 67° 00 °W

POSN AT 0600 71° 35' °N 65° 30' °W

POSN AT 1200 71° 58' °N 70° 08' °W

POSN AT 1800 72° 34' °N 71° 53' °W

POSN AT 2400 73° 40' °N 75° 32' °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY 14.75

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

Start 02:30 end 05:15

Start 14:30

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON GMT

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 19 Knots

WIND DIR _____ °T

REMARKS:

wind dir 90 °R

ship hdg 046

ship sp° 0

seas slight chop

Roll slight

Overcast

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 24

DATE Oct 7, 1981

DAY 32

POSN AT 0000 73° 40' °N 75° 32' °W

POSN AT 0600 73° 54' °N 80° 13' °W

POSN AT 1200 73° 51 °N 82° 18' °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

ARCTEC PERSONNEL ABOARD

1. M Steele
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED 15 Knots

WIND DIR _____ °T

REMARKS:

Wind Dir 355° °R

Ship Hdg 254°

Ship Spd 15.1

Seas : Calm

Roll : None

Overcast

ARCTEC CANADA LIMITED

ENGINEERING DESIGN CALCULATIONS

JOB NO. ..... SHEET ..... OF .....

PROJECT ..... DATE .....

SUBJECT ..... BY .....

Ships schedule ..... CH'K. BY .....

	GMT Time	Day	Date
Arrive Nanasivik Dock	04:00	Fri.	Aug. 2[illegible]
Repairs start			
Repairs End		Fri	Sept 4
Begin to load concentrate		Sat	Sept 5
End loading concentrate	20:00	Sun	Sept [illegible]
Depart Nanasivik	23:00	Sun	↓
Arrive Antwerp Dock	05:00	wed	Sept. [illegible]
Begin Unload concentrate	08:30	wed	↓
End Unload Concentrate	19:30	Thur	Sept-
Depart Antwerp	23:30	Thur	↓
Arrive Amsterdam drydock	16:00	Fri	Sept. [illegible]
Depart Amsterdam	04 30	Sat	Sept-2[illegible]
seized Piston, ship stopped at ~ 70°30'N 66°14'W	10 10	Sat	Oct-[illegible]
Engine Repaired, Underway at ~ 72° N 70° W	14 30	Tues.	Oct. [illegible]
Arrive Nanasivik	18 15	wed	Oct. [illegible]
Begin to load concentrate	21 00	wed	Oct-[illegible]
End loading concentrate			
Depart Nanasivik			

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 25

DATE Oct 8, 1981

DAY 33 ~~34~~

POSN AT 0000 Nanisivik °N °W

POSN AT 0600 °N °W

POSN AT 1200 °N °W

POSN AT 1800 °N °W

POSN AT 2400 °N °W

ARCTEC PERSONNEL ABOARD

1. M. Steele
2. W. Blount
3.
4.
5.
6.

NAUTICAL MILES STEAMED THIS DAY 0

HOURS STEAMED THIS DAY 0

FUEL CONSUMED THIS DAY 0

HOURS OF RECORDING THIS DAY 0

WEATHER AT NOON

AIR TEMP above 0 °C

DWPT TEMP °C

WIND SPEED Knots

WIND DIR °T

REMARKS:

TESTS CONDUCTED:

Harold: re-familiarized himself with computer
→ started a playback program on data Mike had collected

M & H → found faulty switch in box #4 and fixed.

→ ~~debugged~~ Mike briefed W.B on problems encountered and expected solutions W.B simplot finished.

W.B → assembled small environmental housing with T.V. and a tiltable mount for forecast boat-out room.

PROBLEMS ENCOUNTERED:

→ obtained permission to install camera

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page 26

DATE Oct 9, 1981

DAY 34

ARCTEC PERSONNEL ABOARD

1. Harold Blount
2.
3.
4.
5.
6.

POSN AT 0000 EST	Manuscript	°N		°W
POSN AT 0600		°N		°W
POSN AT 1200		°N		°W
POSN AT 1800		°N		°W
POSN AT 2400	73 44.54	°N	83 15.66	°W

NAUTICAL MILES STEAMED THIS DAY

HOURS STEAMED THIS DAY 10 hrs

FUEL CONSUMED THIS DAY

HOURS OF RECORDING THIS DAY

WEATHER AT ~~NOON~~ MIDNIGHT, ~~GMT~~

AIR TEMP °C

DWPT TEMP °C

WIND SPEED 20 Knots

WIND DIR 295 °T

REMARKS:

ship speed 13.2 kts
heading 55°
into Lancaster Sound.

TESTS CONDUCTED:

PROBLEMS ENCOUNTERED:

→ balanced all gauges in Bays 1-4, found 2 bad ohmmeters
→ installed T.V in mast lookout
→ found camera was inoperable and so stole T.V. camera from large housing, put automatic iris on and system operable
→ had problems with tape unit #1 cutting out (losing vacuum) despite cleaning.
→ started up gyros and checked D.R. program.

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page _____

DATE Oct 10, 1981

DAY 35

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 72°41' °N 73°13' °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT ~~NOON~~ 1100 GMT

AIR TEMP −2 °C

DWPT TEMP _____ °C

WIND SPEED 1 Knots

WIND DIR 235 °R

REMARKS:

Ship heading: 135.4°

Ship speed: 15.6 KTS

Seas: calm, odd iceberg and heavy bit.

Roll: none

scattered cloud,

TESTS CONDUCTED:

received 3 master cards (Box 1 + spare)

→ suspect "auto zero" acts maybe causing some of drift problems.

→ ran statistics check on D.A.S.

→ discovering unexplained transient

PROBLEMS ENCOUNTERED:

slowed to 5 KTS in darkness and fog last night - but the odd small piece

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page _____

DATE Oct 11, 1981

DAY 36

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS:

ship speed up to 16.2 KTS during night
→ no problems in navigating (no ice)
→ a few bergs easily avoided.

TESTS CONDUCTED:

discovered Peak ≠ Real problem in DAS – checked "bad" cards and found no faults
- raw statistics check on quality of signals showing "bad" cards not necessarily noisy

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page _____

DATE Oct 12, 1981

DAY 37

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP −1 °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS:

light snow, and very light wind off port bow

TESTS CONDUCTED:

Investigated peaks + Baal problem, cleaned suspect edge connectors, inspected bus interface with scope discovered irregular scope trace for non-functional "peaks" channels.

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page _____

DATE Oct 13, 1981

DAY 38

POSN AT ~~0000~~ 0949GMT 59° 32' °N 46° 39' °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY ~~0~~ ∅

TESTS CONDUCTED:

boat drill -

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP +3 °C

DWPT TEMP _____ °C

WIND SPEED 35 Knots corrected

WIND DIR 360° ~~T~~

REMARKS:

ship speed 15.2 KTS

- choppy sea, little roll

- rounding Cape, Greenland in sight

heading ≐ 145°

PROBLEMS ENCOUNTERED:

- no response on Master compass

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page _____

DATE Oct 14, 1981

DAY 39

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS: fair weather, no roll

TESTS CONDUCTED:

- completed repairs on all M cards and system looks fine through rope test loop
- ran DA program and system crashed
- tried to load new program and system would not co-operate → tape would just sit there on-line not loading any data or progs.
- shut system down for evening (possibly a thermal shut down problem?)

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page _____

DATE Oct 15, 1981

DAY 40

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS: poor weather, no roll

TESTS CONDUCTED:

- tried to bootstrap computer again but with no success
- decided it was a mag-tape interface problem with the ROMs
- sent telex to Ottawa stating same.

PROBLEMS ENCOUNTERED:

- worked on a board to process amplifier signals to make them compatible to our SE labs 0-1 volt recorder
- repeatedly tried to load program without success
- received telex from Ottawa and tried to bootstrap following using 377 read, examine, deposit, start, =PL

ARCTEC CANADA LIMITED

ENGINEERING DESIGN CALCULATIONS

JOB. NO. ..... SHEET ..... OF .....

PROJECT ..... DATE .....

SUBJECT ..... BY .....

..... CH'K. BY .....

as described in instruction manual for "User instructions 'L' programs" (undated copy). Was unable to load floppy discs (tried 'L' program 5 and many others) — sent telex clarifying problem to G & M with copy to ED Arctec

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page _____

DATE Oct 16, 1981

DAY 41

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS: a little rain, moderate roll at times

TESTS CONDUCTED:
- computer system working this morning
- sent telex to GSM stating it was possibly a operator error in the batch (only explanation)
- balanced cards in hour and ran system for 20 min successfully
- then system started to crash

PROBLEMS ENCOUNTERED:
- started having "loss of vacuum" problems and decided system was getting too hot
- decided problem definitely with the bus and/or bus interface and would stop experiments with the bus tomorrow until a cool system.

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page ____

DATE Oct 17, 1981

DAY 42

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP 9 °C

DWPT TEMP _____ °C

WIND SPEED 14→0 Knots

WIND DIR 360 °T

REMARKS:

Ship speed 15.6 knots
heading 152.6°
POS. [56° 41' N
0° 40' W
calm sea
0846 GMT.
W coast of Scotland
at Aberdeen

TESTS CONDUCTED:

→ experimenting with interface timer → adjusted to 35μs
→ discovered vacuum leak in Mag Tape unit #1
→ system running well now
→ discovered box #2 addressing problems

~~PROBLEMS ENCOUNTERED~~:

→ sorted out accelerometer channel assignments in box #1

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page ____

DATE Oct 18, 1981

DAY 43

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS: log

approach into Antwerp
- anchored off river mouth for 3 hours "waiting for tide" until 2 pm
- arrived Antwerp 10 pm local time (2100 GMT)

TESTS CONDUCTED:
- took a look at ~~vacuum~~ Box #2 and decided not to repair at present - a big job so removed cards from bad channels.
- balanced gauges in box 1-4
- did peak vs real computer comparisons & noted inaccuracies in Peak mode.

PROBLEMS ENCOUNTERED:
- had 45-min successful run.
- error in docking "data acquisition" in Antwerp.
-

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page _____

DATE Oct 19, 1981

DAY 44

POSN AT 0000 Antwerp °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

WEATHER AT NOON

AIR TEMP +10 °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS: cloudy with some rain in the afternoon.

TESTS CONDUCTED:

- ran system, no problems after more hoses were better sealed.
- reached an EOT on tape from previous recording session and halted (no crash) so must be careful during real testing!
- phoned Mike and relayed all problems with system and present status
  - Told him I was satisfied that system will operate as

PROBLEMS ENCOUNTERED: "dead" made for 2 trips and possibly with some "leaky" circuits fixed.

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page ____

DATE Oct 20, 1981

DAY ____

POSN AT 0000 ANTWERP °N ____ °W

POSN AT 0600 ____ °N ____ °W

POSN AT 1200 ____ °N ____ °W

POSN AT 1800 ____ °N ____ °W

POSN AT 2400 ____ °N ____ °W

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. ____
3. ____
4. ____
5. ____
6. ____

NAUTICAL MILES STEAMED THIS DAY ____

HOURS STEAMED THIS DAY ____

FUEL CONSUMED THIS DAY Ø

HOURS OF RECORDING THIS DAY Ø

WEATHER AT NOON

AIR TEMP ____ °C

DWPT TEMP ____ °C

WIND SPEED ____ Knots

WIND DIR ____ °T

Polaris ship left our port side at 10 pm

REMARKS: rain, 10°C

TESTS CONDUCTED:

lostred into M card problem in bridge box
→ repaired cards and checked Doppler, windspeed, direction cards
Phoned George re ice trials
→ helicopter acc. in engine room.
system still shut down to reduce dirt contamination while unloading ore.

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page ____

DATE Oct 31, 1981

DAY ____

POSN AT 0000 Antwerp °N ____ °W

POSN AT 0600 ____ °N ____ °W

POSN AT 1200 ____ °N ____ °W

POSN AT 1800 ____ °N ____ °W

POSN AT 2400 ____ °N ____ °W

NAUTICAL MILES STEAMED THIS DAY ____

HOURS STEAMED THIS DAY ____

FUEL CONSUMED THIS DAY ____

HOURS OF RECORDING THIS DAY ____

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. ____
3. ____
4. ____
5. ____
6. ____

WEATHER AT NOON

AIR TEMP ____ °C

DWPT TEMP ____ °C

WIND SPEED ____ Knots

WIND DIR ____ °T

REMARKS:

Sunny with cloudy periods, some rain
9°C

Polish ship finished loading & cast off at 0730 hrs
→ continuing to steam north.

TESTS CONDUCTED:

→ worked with boys 1→4 balancing and "repairing" M card bin #3
→ re-inserted M card in bin #11
→ started system up and ran DA tests

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED 734C

MV ARCTIC - 1981

LOG OF ACTIVITIES Page _____

DATE Oct 22, 1981

DAY _____

ARCTEC PERSONNEL ABOARD

1. BLOUNT
2. _____
3. _____
4. _____
5. _____
6. _____

POSN AT 0000 _____ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 _____ °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

WEATHER AT NOON

AIR TEMP _____ °C

DWPT TEMP _____ °C

WIND SPEED _____ Knots

WIND DIR _____ °T

REMARKS:

TESTS CONDUCTED:

- received telex from G & M abt requesting more info on seatex problems - sent reply.
- ran systems while leaving Antwerp with no problems
- found fault in roll card and now working O.K.

PROBLEMS ENCOUNTERED:

ARCTEC CANADA LIMITED

734C

MV ARCTIC - 1981

LOG OF ACTIVITIES

Page _____

DATE Oct 23, 1981

DAY _____

POSN AT 0000 ~~Aberdeen~~ °N _____ °W

POSN AT 0600 _____ °N _____ °W

POSN AT 1200 _____ °N _____ °W

POSN AT 1800 GMT Aberdeen °N _____ °W

POSN AT 2400 _____ °N _____ °W

NAUTICAL MILES STEAMED THIS DAY _____

HOURS STEAMED THIS DAY _____

FUEL CONSUMED THIS DAY _____

HOURS OF RECORDING THIS DAY _____

ARCTEC PERSONNEL ABOARD

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

WEATHER AT NOON

AIR TEMP +8 °C

DWPT TEMP _____ °C

WIND SPEED 30-11.8 Knots

WIND DIR 00 °T

REMARKS:

1000 GMT
ship speed 11.8 kts
(LIDS testing)
most of day at 16 KTS

TESTS CONDUCTED:

- LIDS conducted some tests at 1000 GMT, reducing RPM/pitch
- finished interface for FAX recorder.
- recorded maneuvering in Aberdeen at 1600 GMT (FAX & Card.)
- sent telex off to George.

PROBLEMS ENCOUNTERED:

suspect RPM "analog" not working → will investigate tomorrow.

ARCTEC CANADA LIMITED
ENGINEERING DESIGN CALCULATIONS

JOB. NO. 734C
PROJECT Log of Activities
SUBJECT
SHEET 1 OF 1
DATE Oct 24/83
BY
CH'K. BY WB

1356 GMT

Lat. N 58° 48.7'
Long. W 9° 55.4'
} north of Hebrides.

wind spd 45 KTS - 13.8 KTS
dir 340°

ship spd. 13.8 KTS
dir. 269.4°

air temp + 5 °C

Tests & Problems

- looked into RPMS "analog" and concluded it was O.K.
- reduced data from Aberdeen departure statistically
- trouble finding other "later" file on tape, too much unrecorded tape to next file ∴ must remember to record on "stopped" tape only if analysis prog. is used first to locate the end of data.

ARCTEC CANADA LIMITED

ENGINEERING DESIGN CALCULATIONS

JOB. NO. .....
PROJECT 734C Log of Activities
SUBJECT .....

SHEET ..... OF .....
DATE Oct 25/81
BY ZHB.
CH'K. BY .....

1202 GMT

LAT N 58°47'
W 17° 42'
} mid atlantic

Wind 45kts
100°

Ships speed 10kts.
heading 270°

weather mod-sea.
+ 7°C

Ran system for 5 minutes but crashed, suspect shocks from heavy seas has loosened cards in bow (or large dynamic signals tripping A/D up.
→ seas too heavy to go forward and investigate

ARCTEC CANADA LIMITED
ENGINEERING DESIGN CALCULATIONS

JOB NO. 734C
PROJECT
SUBJECT 0930 GMT

SHEET ... OF ...
DATE Oct 26/81
BY
CH'K. BY

pos. N 58° 54.78' } Mid Atlantic
W 24° 41'

Shipspd 3.7 kts
Heading 261°

winds. 70 KTS gusting 80 KTS
dir 0° ahead.

heavy seas ahead.

→ ran system at 0930 GMT, ran into problems and crashed. → suspect same problem as Oct 21 with seas.
→ can not go forward because of seas.
→ reduced statistics on scan.
→ ran video and FM recorder (with voice sync.)

At 2 PM 2 men overboard, conducted search for rest of day.
→ persisted in aft stbd bailing water from leaking aft-peak bulkhead,
→ starboard bracket at #1 hatch had opened and worked its way across hatch #1 and down the port side to front of hatch #5 ripping up cabling as it travelled
→ All equipment tied down and shut off during manoeuvre for rest of day due to heavy roll

ARCTEC CANADA LIMITED
ENGINEERING DESIGN CALCULATIONS

JOB. NO. 734C
PROJECT
SUBJECT Daily log.

SHEET 1 OF
DATE Oct 27/81
BY
CH'K. BY

~~Tape #08 Oct 1/81~~

position - 500 miles from Cape Farewell

ship speed 10 KTS
heading 270°

winds rpd. 40 - 50 KTS
dir 0° (ahead)

Rolling today but not as much as yesterdays storm

T.V. system is out and computer interface indicates an "invalid data" alarm.
Suspect the problem is that power has been lost in the bow due to cable damage from yesterdays storm.

Disconnected bus going forward and ran test loop with scope to check out rest of system - experienced addressing problems most likely due to "spurs" in bus detected a week ago during open loop experiments

System will be checked out when weather improves

ARCTEC CANADA LIMITED
ENGINEERING DESIGN CALCULATIONS

JOB NO.
PROJECT 734C
SUBJECT 1318 GMT

SHEET ... OF ...
DATE Oct 28/81
BY HB
CH'K. BY

position LAT N 58° 55' 154 MILES FROM
W 39° 00' CAPE FAREWELL

SHIP SPD 15 KTS
SHIP HDG 274°

WIND SPD 25 KTS - 15 KTS = 10 KTS
DIR 0° AHEAD

SUNNY, + 8°C, SLIGHT ROLL, 3 ICE BERGS SIGHTED

POWER WAS TURNED OFF IN THE BOW PEAK DUE TO RISK OF FIRE DURING STORM WHICH HAS EXPLAINED TV AND COMPUTER FAILURES. POWER BACK UP AND T.V. AND BUS APPEAR O.K P

POWERED UP GYRO AND DISCOVERED BAD FUSE

INVESTIGATING DOPPLER LOG TODAY, SET UP SPARE DVM TO MONITOR THROUGH "TELEPHONE" INTERFACE. NOTED CONSIDERABLE DRIFT ON SIGNAL ABOUT 15KTS READING. THIS IS NOT OBSERVABLE ON SAT. NAV SINCE IT AVERAGES READING OVER A LONG PERIOD.

ARCTEC CANADA LIMITED

ENGINEERING DESIGN CALCULATIONS

JOB. NO.

PROJECT

SUBJECT 1517 GMT

SHEET OF 1

DATE Oct 29/81

BY

CH'K. BY

AOS. N 60 10 } 100 miles FROM GREENLAND COAST
W 49 14 } 300 mi FROM CAPE FAIRWELL

SPD 15.4 KTS

HDG 326°

WIND SPD 20 KTS - 19.4 KTS

DIR 60°

TEMP +2°C

PROBLEMS WITH COMPUTER CRASHING

→ DISCOVERED USE OF EDGE CONNECTOR IN DRIVER #2 ON INTERFACE FIXES PROBLEM AND SYSTEM APPEARS TO RUN O.K!

→ REASON UNKNOWN AT PRESENT.

ARCTEC CANADA LIMITED

ENGINEERING DESIGN CALCULATIONS

JOB. NO. .....
PROJECT .....
SUBJECT 1429 GMT .....

SHEET ..... OF .....
DATE Oct 30/81
BY .....
CH'K. BY .....

POS. N 63° 39'
W 54° 37'

SPD 7.5 KTS
HDG 319°

WIND 7 OKTS — 7.5 KTS
DIR 20°

2 5 ft swell

- SEAS TOO HEAVY TO WORK ON DECK IN BOW TODAY

- DISCOVERED SOURCE OF NOISE IN DRIVER #2, BUS INTERFACE. BELIEVE IT EXPLAINS 90% OF SYSTEM FAILURES. FIXED AND SYSTEM RAN WELL AT ALL SAMPLING RATES.

- CALIBRATED FM RECORDER FOR 0 — 10V OPERATION (5V REF) AND BUILT 110VAC RELAY BOX FOR REMOTE OPERATION THROUGH PHONE LINES.

ARCTEC CANADA LIMITED

ENGINEERING DESIGN CALCULATIONS

JOB. NO. ..... SHEET ..... OF .....

PROJECT ..... Oct 31/81 DATE .....

SUBJECT ..... BY .....

1440 GMT CH'K. BY .....

POS. N 65° 49' } 150 mi TO DURBAN
W 58 33

SPD 13.1

HDG. 328°

WIND SPD 40 KTS – 13.1 KTS

DIR 10°

-5°C, ICING ON FOC'S'LE

11 BERGS SIGHTED AT THIS TIME

GROWLER SIGHTED 3 BEARS OFF THIS MORNING

NOV 1/81

BROUGHTON ISLAND UNTIL 8AM.

- BEN & DARLENE ABOARD ON 997C WITH VIDEO EQUIPMENT
- RAN 2 VIDEO CABLES TO BOW
- SECURED ALL GEAR IN LAB.
- LOOKED INTO SIN/COS LEVELS AND FAULT APPEARS TO BE WITHIN GYRO
- RECEIVED ENTRAN ACC. FROM G&M
  - WILL NOT INSTALL SINCE AFT SURGE ACC APPEARS O.K.

- RAN SYSTEM O.K. BUT REDUCTION PROGRAM CRASHED → SUSPECT BAD TAPE SINCE IT HAS BEEN WRITTEN OVER MANY TIMES IN LAST WEEK

NOV 2/81

1348 GMT
15.7 KTS
331° HEADING
POS. N 68° 58'
W 64° 27'
0°C
SUNNY

→ NOTED "INVALID" DATA LIGHT ON COMP. INTERFACE
→ RAN SYSTEM WITH NO PROBLEMS
REDUCED "ZERO" STRAIN DATA STATISTICALLY
→ TERMINAL CAME UP WITH "PAPER FAULT"
FOR NO APPARENT REASON AND CRASHED
STATISTICS
→ RAN AGAIN WITH NO PROBLEMS

→ WIRED UP FM RECORDER IN BOW
→ ROPED DOWN, INSTALLED "RELAY" TO
POWER UP FROM LAB, COVERED WITH PLASTICS

→ RE-CONFIGURED FILTERS

GEN. LOG. NOV 3/81

750 GMT

POS N 72° 47'
W 73° 32'

OFF POND INLET

SHIP SPD 7.2 KTS

HDG 312°

WIND 10 KTS ± 7.2 KTS

DIR 190°

SUNNY 8/10 ICE COV,

GROWLERS IN BROKEN 1ST & 2ND YR ICE

4/10 SOLID PANCAKE

RECORDED TAPE #13 & #14

- BALANCED GAUGES
- SENT TELEX TO ARCTEC WITH HOURS AND TAPE REQUEST.
- CHECKED RECORDER OVER. IN BOW PEAK.

1600 GMT NOV 4/81

POS. N 73° 42'
W 77 08'
} ROUNDING BYLOT ISLAND INTO LANCASTER.

BLOUNT
BEN
DARLENE

SPD 14.6 KNTS

HDGING 320°

-5°C

WIND 30KTS - 14.6

DIR 350°

ICE. FOLLOWING OPEN WATER LEAD
→ 1ST YR ICE WITH RIDGING
→ OPEN PACK ICE 1/10 COV.

→ TAPES 15 & 16 & 17 RECORDED
→ LOST BALANCE ON 150 132 ~~128~~ 137 131 AFTER LARGE MYR IMPACT AND COMPUTER "NEW FILE" CRASH

NOV 5/81

POS. North of BYLOT IN LANCASTER SOUND.

SHIP SPENT MOST OF DAY STATIONARY WHILE CAMERAS WERE MOUNTED ON PORT & STBD SIDES.

→ PERFORMED DOPPLER LOG CALIBRATION FOR ACC. CURVE

NOV 6/78

POS. OFF BYLOT NORTH COAST APPROX. 50 MI

WIND NIL.
TEMP ≈ -10°C

RECORDED TAPES 19 → 21

SEVERAL COMPUTER CRASHES ON UNIT #0

REDUCED LIMITED AMOUNT OF TODAYS DATA AT PURINA EVENING.

ATTEMPTED TO RUN SYSTEM AT 0500GMT BUT SYSTEM CRASHED 8 TIMES ERASING PROGRAM EACH TIME.

→ CONSIDERABLE PROBLEM WITH GAUGES DRIFTING. ± 200 → 1800 μS over 2 → 6 HRS.

NOV 7/81 1551 GMT

POS. N 73 52 } APPROACH TO
W 82 40 } ADMIRALTY INLET

SPD 2.7
HDG 276°

ARCTIC
BLOUNT 734C

WIND 7 KTS – 3 KTS
360°

BEN
DARLENE } ICE TRIAL

-12°C

SYSTEM RAN WELL ALL DAY UNTIL 5 PM AT WHICH TIME PROGRAM FOR DATA ACQ. ERASED IT SELF SEVERAL TIMES AS EXPERIENCE NOV 6 EV.
OPENED WINDOW FOR 3 HRS AND COOLED ROOM DOWN AND THE SYSTEM RAN WELL.

SHIP PARKED AT 10 PM.

RECORDED TAPES 22-25

CLEANED VACUUM 'TAPE CLEANER" ON BOTH MACHINES.

NOV 8

POS MOUTH OF ADMIRALTY INLET

$-5°C$

LIGHT WIND, SNOWING IN MID MORN.

RAMMED MYR PIECE FOR 1 HR

→ PARKED SHIP AND REMOVED CAM. FROM OVER THE SIDE.

→ RECORDED TAPES 26, 27, 28, 29, 30

→ SYSTEM RUNNING WELL AT 1200 ch/s. 1700 S/S CRASHED

→ RECORDED 1) LEVEL ICE IN ADMIRALTY
2) MANOEVERING INTO NANISIVIK AND DOCKING. (BOB. ON).
3) TWO YR ICE IN MOUTH OF ADMIRALTY.

NOV 9/81

NANISIVIK

-5°C

→ SHUT SYSTEM DOWN INCLUDING FANS AND GYRO FOR DURATION IN DOCK (TRYING TO MINIMIZE DIRT IN SYS.)

→ PHONED MIKE → 1) WILL SHUT SYS. DWN
2) SEND ANALOG RECORDER BACK
3) MY ARRIVAL IN OTT WILL BE NOV 30
4) DISCUSSED REPORT FORMAT

→ WROTE UP BRIEF SUMMARY OF LOG FOR OCT. INCLUDING A SUMMARY OF SYSTEM PROBLEMS AND MAINTENANCE

NOV 10/81

NANISIVIK:
FILLED #4 HOLD
LAST NIGHT.
WORKING ON
#2 HOLD.

LOADING IS SLOW
AND MAY TAKE
US TO THURS.

ADCTEC
PERSONNEL

DARLENE & BEN
FLEW OUT AT 6 AM.
WITH
MELVILLE: TED THOMPSON
BARRET DIXIT
VEIER JONES: MIKE ?
CCGS: JOHN
MACALLUM
VARSTA: (KAYE)?,
ALSKA
MARTIN LUCE STILL
ABOARD.

NOV 11/81 2400 GMT

POS. ADMIDALTY INLET, 30 MILES FROM NANISVIK
SPD AVE 9 KTS
HEADING 40°

WIND — 35 KTS, 340°

−15°C

LEFT NANISVIK AT 3 PM LOCAL TIME (2000 GMT,
— BUBBLERS WILL BE ON CONTINUOUSLY UNTIL WE
RIDE FREE OF ICE

→ BALANCED ALL GAUGES BEFORE DEPARTURE,
FIXED UP GYRO AND SYSTEM

AT 0045 GMT NOV 12 → LOST BALANCE ON
GAUGE # 89 & 94

1800 GMT

NOV 12

POS: LANCASTER SOUND APPROX 15 MI OFF SHORE

SPD 0 — 6 KTS

HEADING APPROX 70°

WIND 7 KTS
150°

TEMP: −16°C

ICE: 1.5/10 MYR, 1.5/10 2ND YR, 7/10 1ST YR PACK ICE.
4-5 FT FROM BOARD. 6 FT ↑ , ↑ 2 FT

RECORDING VIRTUALLY CONTINUOUSLY SINCE NANISIVIK IN
1) S.G all PEAK, ACC all filters, PROP. NORM REAL,
2) S.G. FILTERS, " " " " "
3) " " " " ", PROP TORQ & THRUST AT HIGH RATE.

BALANCED ALL GAUGES ON MORNING

NOV 13.

1200 GMT

POS. 30m OFF MOUTH OF NAVAL BOARD INLET.
IN ICE BERG FIELD.

SPD - BACKING & RAMMING WITH @ LOUIS HE-

WIND 5 KTS
TEMP -20°C

BY APPROX. 3 PM WE WERE WELL CLEAR OF BERGS AND IN INLET STEAMING AT 5-10 KTS. IN LOUIS TRACK.

STOPPED FOR NIGHT IN ECLIPSE SOUND TO PULL A PISTON AND REPAIR A FROST VALVE.

STATISTICAL DATA RED. TAPE #36.

BALANCED ALL GAUGES IN EARLY MORNING.

NOV 14/81

1700 GMT

POS. POND INLET IN 1ST YR & PANCAKE ICE WITH 5/10 COVERAGE. FOLLOWING LOUIS "TRACK"

SPD 13 KTS.

WIND 5 KTS
TEMP -20°C.

BALANCED GAUGES, DISCOVERED CH 174 WAS NEEDLESSLY BEING SAMPLED AT 100 HZ. IN "INITIALIZATION" SAMPLING PATTERN.

REDUCED DATA ON TAPE #36, AND TAPE #32 AT TIME OF S. GAUGE IMBALANCES.

REDUCED DATA ON TAPE #37 STATISTICALLY WHILE STOPPED FOR NIGHT → LOUIS STOPPED SO ARCTIC FOLLOWED SUIT

NOV 15/81 1500 GMT

POS. 50 mi OUT OF POINT FOLLOWING LOUIS TRACK

SPD 7-10KTS

WIND 40KTS

-20 °C

ICG → 9/10 1ST YR @ 8-12" WITH RIDGING & LEADS
1/10 MYR & 2ND YR (6ft)

10/10 COVERAGE 99% OF TIME

LOST BALANCE ON S.G. # 116 & 118 @ 1730 GMT

RAN LAST TAPE INTO NIGHT WHILE FOLLOWING LOUIS TRACK — NO EVENTS OF INTEREST

APPENDIX B

MAINTENANCE LOG

MAINTENANCE LOG

The following is a maintenance log which details specific system problems and the resulting actions by the operators in chronological order. The daily log in Appendix A summarizes these logs along with other ship activities.

MALFUNCTIONS

Sept. 2, 1981

1. After replacing connector to tilt-pan relays from decoder card in camera, tilt working sometimes, sometimes not.

2. Iris functioning okay.

3. Ck'd aft surge and found RL = 2.5 v. This was after card had been changed by Harold and myself on August 30.

4. Time-date generator not working, no picture out when turned on.

5. Contrast pot on playback TV N/G, loose picture sometimes, should be worse in ice due to vibration.

6. Wind spd. computer output is wrong, suspect conv. equation.

7. Dave tells me conv. equation for torque is also wrong.

EQUIPMENT MALFUNCTIONS Sept. 6, 1981

Sept. 06-81: After leaving port the TV controls began to work intermittently. Problems with close iris, tilt up and tilt down. All working at 02:00 GMT Sept. 7.

Sept. 07-81: Came down at 11:30 GMT to find no 24 VDC power coming from TV camera to controls in lab. Checked breaker for power to TV in forecastle - OK. Still no power in lab control box. Far too windy to climb mast and try any repairs in Env. Housing. Totally ridiculous to have the transformers in the env. housing, sending 24V to lab and then back again to relays in env. housing.

Also when I came down tape out alarm was on and no vacum to tape drive. Suspect we lost power in the night. Tape badly creased at one section and tore.

More - Re TV checked and there is 24V at the term strip in the env. housing (Brn. and Or.). There is 24V in the J Bx. on top of the masthead (Bx w hinge). There is only 1.5 V at the cable to the controls in the Lab, and only 1.5V in the J-Bx in the Electrical Compartment Room right before the cable goes outsid Problem must be either in splice that J.Sterling did while he was here (on the deck) or in the J-Bx under the lip of the Forecastle to the left of the masthead ladder.

Aft surge gone - was pulling down Bus T-2 FO w Bus down
T-2 Bus okay - pulled card

Sept. 8 Found broken splice from power supply to TDG. This has now been repaired, but because still have no video, cannot tell if TDG is now okay.

Sept. 8 More re TV: checked the splice 1.5V Brn or Or. splice looks quite good though so problem is probably at the J-Bx under the forecastle.

Most curious. By switching the Bridge-Lab switch to bridge used to take the +24 (or) line up to the bridge (it now sends the line nowhere) and measuring the voltage you get + 4.5 V. which means that part of the voltage drop is because of the control box. I then unsoldered the Brn ground line from the control box. With the orange line running into the control box you get +4.5V, with it switched off via the bridge-lab switch you get +5.5V.

With ground soldered back on, I've noticed that when switch is to "Lab" (as usual) you get 1.5 V. But with switch to "Bridge" you get -2.7V.

EQUIPMENT MALFUNCTIONS - con't.

To get around the problem of no 24V to the controls in the lab, I've disconnected the Orange and Brown lines and now am using the spare Lambda power supply. The supply gives ±15 V but I've adjusted it down to ±12 V and am coming off the + side to a RED alligator lead and the - side to a yellow lead running into the controls. If the power supply is needed to troubleshoot any cards, it now must be readjusted to ±15V.

Controls are all working again except iris close is still intermittent. Now that I have a picture, it is determined that the TDG is still not working.

Sept. 8 Checked Aft Surge (Bad) and Aft Sway (Good)

A-B	600 ohms	564 ohms
A-C	430	421
A-E	982	837
B-C	440	423
B-E	992	842
C-E	1118	837

Sept. 9 While in same rough seas the TV failed. I can't tell if we have a picture or not. We started getting into some fog and the picture got dim and finally went out. On investigation the camera appears to be either pointed up or down past its limit switches. No tilt-pan controls work. Can do nothing about it because of the weather.

Sept. 10 TV back on - by itself - tilt up intermittent as is Iris Open and pan port

Sept. 11 Pull TDG and checked that power is coming into the Lab. Power okay so I assmue the problem with it is not easily fixed. Have had no control over tilt-up and pan port this morning. Iris okay.

Sept. 12 TV camera now shuts off if any switch other than iris open and zoom in is pressed.

Sept. 13 TV same as on 12.

EQUIPMENT MALFUNCTIONS con't. Sept. 14, 1981

Sept. 14 Put aft surge amp card back in ch 212. Took sway, put it in ch 212 and zero'd card to - 5.00V RL. Took surge and put it in ch 213. Did not zero. Voltage was - 6.15V at 05:15 GMT will check output volgages later in day.

TV controls still all screwed up. Only TV- on, Focus-near, iris-open and slow-zoom-in function, all others turn the TV off! Focus-near, iris-open and zoom-in are all fed by the +12V driver circuit. Nothing on the -12V driver circuit works, in fact as stated they turn the TV off. TV on and blower on work, they are on the +24V circuit, but tilt and pan are also and they turn the TV OFF.

Sept. 15 Ch 213 with surge accel. through sway amp and check now giving + 10.62V. Pretty well confirms that the accel. is bad. Sway accel. in ch 212 through surge card giving +5.01V so surge amp card is GOOD. Have pulled surge card and put inputs back the way they were so surge - not connected, Sway - ch 213 again.

Sept. 16 - TV SYSTEM CHECK OUT

Checked today and there now is again +24V on the down line (orange and brown) from the TV. with that hooked up or with the lab power supply hooked up the lab controls are the same (many turn off the TV).
Checked out the lab controls and found that when (for example) pan port is pushed the voltage between line 5 (blue) and ground is about 18 volts. This voltage turns off the system. I then unsoldered the blue line and found that the 18V does not originate from the lab controls, but comes from the Masthead-env.housing (18 volts between the unsoldered blue line and ground when some buttons are pushed).
Then proceeded to take down the TV line voltage to the housing is as follows: 110 line to tilt-pan relay box, out a 55 bulk head connector mated with 5P that runs into the env. housing. The bulkhead was "Frozen" to it's mate by corrosion and the bulkhead broke off on removal.

State of TV, env. housing and controls as found.

1) housing had water in it
2) moisture on most everything
3) bottom of housing cracked with a fair gap allowing spray in.
4) lot of corrosion on relays and many terminal strips
5) lot of corrosion on back of relay driver card
6) corrosion on - 5 connector terminals and their mates to the relay driver card.

EQUIPMENT MALFUNCTIONS Continued September 17, 1981

Have decided that the easiest thing to do (re TV Camera) is to mount the 2nd TV in a fixed position in the crow's nest. Only need to run a coax from the J-Bx on top of crow's nest, through the air vent, which is stuffed with rags to the TV. There is 110 pwr in the crows nest already. Will try and obtain permission today. Only problem I can foresee re TV is the actual physical mounting of it.
Ampex agent has arrived and is looking at problem with the tape drives.

Strain gauges balanced at 14:00-15:00 GMT. Channels 22 and 129 have drift out of the range of the extended balance cards and are no good now. Channels 33,122 and 167 required on extended balance card to function.

Sept. 19 Ch 122 now erractic RL - card pulled. Was pulling down Bin, 3-7 now okay

Sept. 20 Ch 121 erractic RL - was pulling down bin, card pulled, now okay
Ch 44 - no longer will balance - no good
all cards in Bx 1 Bin 1 are balanced, but show big offsets on log????

Sept. 20 Found Roll (which Dave had said was bad) pulling down 7-15. Checked and pot resistance is good but center tap seems to be opening or shorting, Opened up case, resistance from pin to wiper okay. There are scratches where the wiper has been rubbing the windings, cleaned with alcohol.

Sept. 22 Put surge card back and and balance at 08:30 GMT, at 02:30 RL = 4.98!!
Engine not operating

Sept. 23 Aft surge RL = 4.86 V at 11:00 GMT .005 V/hr drift
.0025 g/hr
moved wires and temp. comp modules - no change
had to put xtend bal. cards in 117 and 139, ch 99 no good

Sept. 24 08:30 GMT aft surge at 7.71V

Sept. 25 07:30 GMT aft surge at 8.78 V adjusted back to 5.00

EQUIPMENT MALFUNCTIONS - continued

All outputs from Bin 1 are wrong. This had been happening with Fenco and G&M couldn't find a problem. Signal to computer looks like it is the 4.5V signal in when system not running. RL voltages are okay. Do not read any CE pulses at master card but do read En Pulser. Probably there is a bad solder connection on the block address lines (M,N,P,R,S) to the master card. I say this because J. Sterling replaced the MC that Fenco was using and said there was a problem with the block address.

Oct. 3 Channels 82, 115, 144, 158 no good - cards pulled

Oct. 7 No pwr to J-Bx 4, cable good, fuses good, not enough time before docking to get in and investigate.

Oct.8 found faulty switch in box #4, repaired and now op.

Oct. 9 installed small environmental housing in foremast look out room
camera did not work, exchanged it with camera that was in pan-tilt system
system now works but snow and ice create problems - will mount higher to look through "clear view" at later date (check it if clear view works!)

Oct. 10 Repaired 3 master cards bin 0, 1 and the spare. I.C.2 and 3 (inverters and AND gates) were major source of problems.

In the spare M.C. IC5 was bad resulting in a Zc (zero check) logic '1' which was causing the S.G. cards to cycle the auto-zero cct. This is a dangerous situation since it is not easily detected. All M.C. were then modified with J4 (Zc) jumpered to "common" since auto zero circuits are no longer used. It would be preferable to disable all the auto-zero ccts. in the S.G. cards but this can be done before next season.

Ran DAS and discovered "peak" not equal to "Real" for many cards.

Oct. 11 Investigating Peak and Real problem
- built up a test rig to check peak detector
- checked cards with peak generator and found no faults in "bad" channels

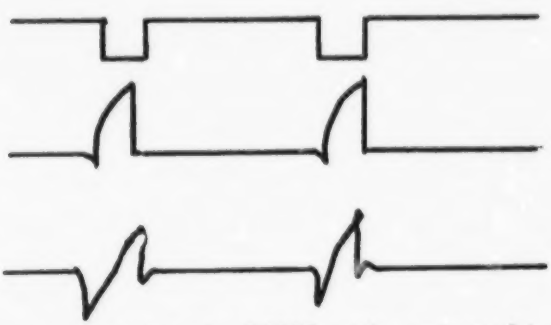
Oct. 12 further checks on "Peak and Real"
- swapped ch # 81 and 82 (good and bad) and problem persisted at same channel 82.
- found no fault with cards 82

EQUIPMENT MALFUNCTION - continued

October 12

- found box #1 acc. cards in wrong locations!
- re-located and was able to balance "heave" and surge only
- will look into problem at later date to decide if it is a "location" problem or gauge problem (no record in logs of a change)

- discovered irregular scope trace on channels that where not working in "Peak" mode



Peak/real logic

"Real"

"Peak" in non-working channel

- ran computer in SCOPE mode and could not find CA pulses (card addressed) with logic probe

- will investigate CA in gen. DAS progr. tomorrow
  - does peak <u>really</u> work on other channels or is it still picking up the <u>real</u> mode?

October 13

Repaired master cards in bin #'s 0,7,8. Has many burnt out logic chips which had disabled card addressing (IC1 and IC2) and peak/real circuits (IC2). Also found in mastercard bin #0,8,12 and 13 that the ZC lines where not being held at logic zero but rather floating between states and probably causing amplifier cards to cycle in an auto zero mode.
IC5 in many cards was burnt out and rather than replace these chips the ZC line was hardwired to COMMON (ground) and IC5 removed if in a DIP socket. This was done to all master cards except bin #11,14 and 15.

In many instances the CA test point (card addressed) indicated a correctly addressing system, however problems with real/peak logic (IC2), ZC logic (obsolete auto-zero circuits), (IC5) and in one case burnt out IC6 (switch control), resulted in a non-functioning system. Without pulling mastercards and bench testing the only clue that the system was <u>down</u> was an unexplained computer printout. On 90% of these malfunctions the value printed out was within 100 to 200 of zero making the operator think it was a gauge zeroing problem.

EQUIPMENT MALFUNCTION - continued

October 14

Continuing to repair mastercard problems as described Oct.13. Re-installed all cards for a final time satisfied all cards were being addressed by TEST loop in computer. Scope was indicating an operating system and the analog bus looked clean with no more clitches as described Oct. 12 (probably caused by switches both "on" mixing real and peak signals - caused by real/peak logic problems).

Experienced problem with data acquisition program crashing and so reloaded program and system ran for a good five minutes and then bombed (tape systems would stay up but reel would stop moving).

Tried to reload program and computer ran with no tape or terminal action. Tried running TEST programs (still in memory) and was successful with computer control through terminal. I again tried to load from mag.tape and still nothing would respond. Since the system reads from mag tape first, in order to acquire instructions, it is not surprising that the terminal does not respond. I then changed the addresses on the 2 tape machines, switched tapes, and tried again with no luck. Turned system off for evening to see if it was a heat problem.

Oct. 15

Computer still will not load from mag tape machines that appear to be operating correctly. Looked for interface spares and could not find any so telexed ARCTEC with report and request for ROLM AGENT and four interface cards.

Note on failure last night: There might have been a power "brown out" before program loading failed as

1) oscillosccpe started to malfunction with a pulsed trace implace of the "straight line" zero

2) had difficulty loading tape, lost vaccum and tape became tangled.

Since both these "malfunctions" fixed themselves 2 minutes later, a "brown-out" may have been the cause of some problems. Since the lights are flourescent, a brown out would not necessarily have been detected.

Oct. 16

Computer started (bootstrapped) with no problems this morning!

- can only say that I must have been bootstrapping incorrectly!
- ran system with no hang up for 20 minute period on selected channels that had been zeroed.

EQUIPMENT MALFUNCTIONS - continued

October 16

- ran all channels scanned and problem of tape drive (or more likely bus) hang up. (No loss of vacuum but just stopped recording with program continuing logging).
- disconnected bus and completed loop with small cable and ran system for 30 minutes with no problems collecting zeros
- concluded that it was a problem on the bus and so I decided it was time to take a look in the bubbler compartment at bin #11

-M card only one at fault: that was a logic "high" when it should always be a logic "zero"

- removed M card but system still hanging up more frequently now
- cleaned tape units (found fluff on heads) but still no fix
- loaded from a different program Mag tape but still no fix
- decided it was a tape problem and went to a new recording tape but still no fix
- disconnected scope from test point to before A/D thinking I was injecting noise but no fix.

At this point, I noticed that unit #0 injects noise into HP scope even with input grounded and so this must have been yesterdays "brown out" source (i.e. not a brown out)

I found the systems mag. tape unit # 1 misbehaving and losing vacuum and decided things were getting too hot so I shut everything down to cool off.

October 17

- tape drives working okay this morning
- decided to increase the timing pulse to 35μS from present 30μS to see if this made a difference
- system ran for 20 minutes on sampling pattern "a" and then quit as before
- disconnected one end of bus loop on theory that pulses are travelling aound the loop and mixing the timing up
- ran for 48 minutes no problems!
  room tem. is 81°F, 27°C
- cleaned fans out, improved flow dramatically!
- lost vacuum on unit #1 just after several attempts to scan but with no luck
- replaced valve/switch and noted that clear hose was not sealing very well
  - cut off hose for a fresh, tight connection and started system up again
  - system running well, suspect this vacuum leak critical in data acquisition where the tape is shuttled back and forth alot for write/read checks.

(but computer does not do a read check)

- balanced all cards and figured out accelerometer channels by a tilt cal.
- box #2 is in a bad way not being addressed correctly.

EQUIPMENT MALFUNCTION - continued

October 17
- returned and found system would not run
- discovered "peak" channels with clitchs as noted before on October 12, 1981

October 18
- looked into distorted "Peak mode" problems and it looks like in box #2 there is a wiring problem in both the addressing and peak/real circuits

- decided dismantling box #2 too large a job at present and we may discover that the problem is in the amp cards since master cards keep checking out okay

- result has been a reduction in the number of channels in box #3 of 15. These cards were not being addressed at all as indicated by the CA line on the cards.
Note that interchanging good cards with bad cards changed bad cards into good cards and vice versa which means the problem is associated with the card slot and channel number.

- ran tape and systems for 45 minutes at 1750 s/second without any problems but in real mode.

- while docking in Antwerp, same pattern crashed after 10 minutes, but this might have been because of radio interference from the 1st mate on the forecastle

October 19
- running system again after last nights crash to see if it is repeatable and it is!

- system ran for 4 minutes and then crashed
- still think it is a tape read error caused by tape drive malfunction
- channel heads and vacuum chambers but no improvement so checked hoses and tightened them all up
- ran system for 20 minutes then a

```
                STATUS  XXXXXX 1Ø61Ø OT WRITTEN

WRITE:          1Ø1OT WRITTEN
DATE
QUEST.          MOUNT TAPE FOR WRITING, Ø or 1?
```

- looks like a bad tape (read/write error) ran tape back (could not see any wrinkles in tape).
- answered "quest." and system started recording
- ran to end of tape, 1Ø1OT WRITTEN
  EOT
  DATE
  QUEST. MOUNT TAPE FOR WRITING 0

EQUIPMENT MALFUNCTION - continued

- very similar to above
  suspect system stopped on EOT from previous exercise!

- system shut down for stay in Antwerp to reduce dirt, etc.

October 20

- adjusted forward camera
- repaired master cards in box 7 on bridge.

October 21

- discovered "loop" is not continuous and was addressing box # 2 incorrectly
- master card in bin #3 appears bad but after a couple of re-insertions in edge-connect problem of addressing disappeared.

These two problems appear to be problems with peak detector circuits since if a channel is not properly addressed a distorted pulse is received at the A/D unit probably causing systems failure.

- considerable problems getting system to operate this evening
- suspect bad tape

Reinstalled M card in Bubbler comp. bin #11.
- balanced gauges (slightly out of balance)

- ran system in real mode, 10HZ/ ch and not looking at first 31 channels
- operated well!
-Noted a periodic pulse in "Peak" LED occurred once every 60 write bursts!

October 22

fixed an intermittent "open cct" in input line on amp card for roll-now believe system working correctly.

October 23

- installed buffer card for interfacing signals to FM recorder
- may have an interference problem on high bandwidth machines (>1KHz)

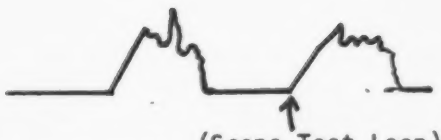
- looked at RPM "analog" card and believe it is not working
  - removing pulse from input and grounding input produces no change in output

(O/P = +4.81 volts)

- checked out circuit and all appears to be working on pulse to period converter but hard to tell without a sig.generator

EQUIPMENT MALFUNCTION - continued

October 28 On channel 212 (Peak)



Removed 212 and system ran okay
- "Noise" should not be noisy if in peak mode - will investigate

- removed suspect channels from sampling pattern (surge (aft), pulse RPM, roll) and system continued to crash
- noted DAS clock up to 40μS, adjusted to 35μS and then 30μS - still crashing

- cleaned tape drives, ran system on unit #0 only - no luck
- discovered that system will run indefinitely with bus disconnected
- also found once recording process started, you can take unit off - line and system continues to scan with no hang up
- re-connected bus, tape unit off-line, system crashed after 30 second of scanning

CONCLUSIONS

Feel now that earlier theory on tape drives pulling system down is incorrect generally speaking. With a disconnected bus and the system operating okay indications are that the problem is with the bus itself (M.C. amp. etc.) or the interface.

- replaced "broken" 8 AMP fuse in 400 Hz gyro supply with 10 AMP S.B. fuse and system became operational. 8 AMP fuse had been taped up containing broken glass tube. The contact presssure was intermittent as evident by oxidization/burn marks on contacts

- balanced surge acc. in engine room and discovered rudder torque (ch 196) was pulling bin down. Removed card, Cal PT = 4V therefore suspect sea water from storm damaged gauge

- set up DVM to monitor doppler log speed. drifts around alot in sinc. with roll and suspect this is normal. Sat. nav. must do an average stabilizing the reading.

- checked all cards in box 1 - 4
- did a rough balance on gauges (+ 1 volt)
- found box 1 and 2 cards had parted from edge connectors during storm (25% of cards)
- found M.C. bin 0 not addressing cards 11, 12 and 13.
- replaced with Bin 2,repaired M.C. #0 - faulty IC #1 (4050 buffer)
- all gauges balanced in box 1 - 4

EQUIPMENT MALFUNCTION - continued

October 28

- Pcan DAS and system crashed
  - removed prop. data box 6 and system ran okay
  - checked box for addressing and no problems
  - observed aft surge to be noisy

- investigated bus circuits and found nothing unexplainable
  - monitored DI-5 line to see if system crash is due to A/D hang-up but DI-5 did not "alarm" with system crash
  - monitored U3D pin 10 for 100 MS time out but no time out occurred during system crash
  - noted U11A pin 4 & 5 tied together and held at logic zero

- removed driver #2, inserted extension card and re-inserted driver module.
  - system ran with no hang up - stop with 'ESC' key after 15 minutes
    Conclusion - suspect contacts are dirty and delaying/ scrambling logic commands from comp.I/O

- cleaned contacts on 1) A/D con.mod.
  2) Logic mod.
  3) driver mod 1 & 2
  with emery cloth and alcohol

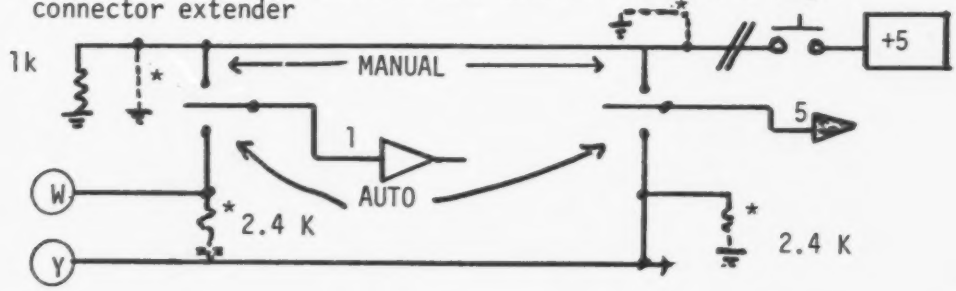
- system still only runs if edge con. in driver #2!

October 30

- replaced surge aft amp card
- handwired +5 volt REF from level pot.
  found non-func. card had 7.5V ref and non-func peak cct

- ran system with edge card ext. with no problems.
  - vibr. a problem with the ext. card in todays heavy sea

- investigated problem associated with driver mod.#2 edge connector extender



-discovered that shorting 1kΩ out to ground improved system performance - system crashed after 10 min. - usual error - run light went out! - generally, in past, run light stays on but bus interface shuts down

* Additions

EQUIPMENT MALFUNCTION - continued

October 30 - Decided (W) and (Y) require aload therefore installed 2.4K res. to ground.

Ran system at highest sampling rate, with all modules plugged in without extension cards and system ran with no problems whatsoever.

wired as indicated in sketch so push button will not short +5V supply

CONCLUSION

1. Lines A & B (enable and Clr?) were picking up transients from bus inductively due to proximity with bus and driver #2 caused by floating lines (W) and (Y) and capacitance effects in switch to a high 1Kr impedence input to buffer (TTL)

2. Opening loop possibly reduced ringing and inductive field therefore seemingly to stop problem.

3. Removing bus removed sources of inductive field by removing load on driver and reducing current (hence RF field)

4. Sampling "Peak" mode channels that have no amp. cards created transient on line which again was coupled to "Floating" auto zero lines causing system crash

System was run in peak mode sampling many channels and system ran through one whole tape at 1700 S/S with no system error.

November 4 - Invalid data light is "ON" on interface alarm mod.
- checked all boxes for power and no problems noted therefore suspect stuck relay.

- 4 gauges (132,150,131,137) were reading "0" at 17:37:11 and 1826, -1758, 1826, 1956 (128,131,132, 137) at 17:36:54

Note that the Comp. was stopped to increase sampling rate but system crashed (started sampling but no data was going to recorder) so system was restarted, time entered by hand (hence obvious error) and started up okay at high sampling rate.

APPENDIX C

SYSTEM STATUS & TAPE LOGS

CONTENTS

INTRODUCTION

TABLE C.1 SAMPLING PATTERNS

TABLE C.2 FILTER LOG

TABLE C.3 GAUGE STATUS SEPT. 8, 1981

TABLE C.4 GAUGE STATUS NOV. 4, 1981

TABLE C.5 GAUGE STATUS NOV. 8, 1981

TABLE C.6 GAUGE STATUS NOV. 12, 1981

TABLE C.7 GAUGE STATUS SUMMARY BY VOYAGE

TABLE C.8 ANALOG RECORDER - PROPULSION, OPEN WATER

TABLE C.9 ANALOG RECORDER - S.G. IN ICE

TABLE C.10 COMPUTER/VIDEO LOG WHILE IN ICE

INTRODUCTION

On September 2, 1981, the status of all gauges was determined and a sampling pattern decided upon and loaded into the data acquisition tape. Table C.1 (a) details this first pattern referred to as pattern A in subsequent logs. Other patterns used are shown in Table C.1 (b) to (j). The filter channel assignments are detailed in Table C.2. Tables C.3 to C.6 document the status of gauges throughout the fall operating season. Note that some gauges designated "bad" earlier in the season re-appear as "good" at a later date. Changing ballast levels would account for this apparent inconsistency permitting bad gauges to dry out and stabilize. Table C.7 summarises the gauge status by voyage and tape and will assist in determining "good" tapes.

Tables C.8 and C.9 are FM analog recorder logs. For Tape FM-1 the propulsion data was recorded with the recorder in the computer lab and the signals delivered via the 5 wire intercom system (part of the computers data acquisition bus). For tape FM-2 the recorder was installed in the forecastle and controlled through a switch activated relay from the control room with the use of the intercom wires. At the same time the ships speed was delivered from the bridge to the computer room and calibrated to read KTS on the digital voltmeter. Throughout the video/computer log (Table C.10) ship speed was read from this meter to assist in the reduction of data.

As discussed in Section 2.3 of Volume 1, the computer system often stopped recording data for no apparent reason. When the program was restarted, the file count was returned to 00 and an asterisk was used to denote this case in the log.

TABLE C.1 (a)

PATTERN 'A' (Effective on Tapes 1-8)

1. All Working Gauges Sampled in Peak Mode. (see Status September 8, 1981).

2.	CHANNEL #	DESCRIPTION	FILTER CHANNEL	RATE (Hz)	MODE R = REAL P = PEAK
	90	Strain Gauge	92	100 Hz	R
	110	"	123	↓	↓
	116	"	124		
	118	"	125		
	137	"	150		
	148	"	171		
	160	"	174		
3.	1	Forward Heave	11	10 Hz	R
	2	Sway	12	↓	↓
	31	Surge	13		
	212	Aft Surge	215		
	213	Sway	216		
	214	Heave	217		P
4.	196	Rudder Torque	-	10 Hz	R
	198	Shaft Thrust	-	10 Hz	R
	208	Shaft Torque	-	10 Hz	R
	209	Shaft RPM (Pulse)	-	10 Hz	R
	211	Shaft RPM (Analog)	-	1 Hz	R
5.	199	Fuel Rack	-	1 Hz	R
	200	Rud.Position	-	1 Hz	R
	201	Propeller Pitch	-	10 Hz	R
	202	Propeller Diff.Press	-	1 Hz	R
	203	Rud.Diff. Press	-	1 Hz	R
	224-226	Manual Inputs	-	0.1 Hz	R
	230-232	Manual Inputs	-	0.1 Hz	R
	233-234	Wind Spd. &Dir.	-	1 Hz	R
	236	Ship Spd.	-	1 Hz	R
	237-238	Compass	-	1 Hz	R
	239-240	Pitch,Roll	-	10 Hz	R
	244-245	Propeller & Rud.	-	1 Hz	R
	252-253	Draft	-	0.1 Hz	R
	255	Event Switch	-	1 Hz	R

TABLE C.1 (b)

PATTERN 'B' (Effective on Tapes 11-49)

1. All working gauges sampled in peak mode.

2.

CHANNEL #	DESCRIPTION	FILTER CHANNEL	RATE (Hz)	MODE R = REAL P = PEAK
98	Strain Gauge	83	100 Hz	R
102	"	123	↓	↓
103	"	124		
104	"	125		
131	"	150		
132	"	164		
133	"	171		
3. 1	Forward Heave	11	10 Hz	R
2	Sway	12	↓	↓
*31	Surge	13		
212	Aft Surge	215		
213	Sway	216		
214	Heave	217		
4. 196	Rudder Torque	-	10 Hz	R
198	Shaft Thrust	-	↓	↓
208	Shaft Torque	-		
209	Shaft RPM (Pulse)	-		
211	Shaft RPM (Analog)	-	1 Hz	R
			↓	
5. 199	Fuel Rack	-	1 Hz	R
200	Rud.Pos.	-	1 Hz	R
201	Propeller Pitch	-	10 Hz	R
202	Propeller Diff.Press	-	1 Hz	R
203	Rud.Diff.Press	-	1 Hz	↓
224-226	Manual Inputs	-	0.1 Hz	
230-232	Manual Inputs	-	0.1 Hz	
233-234	Wind Spd.& Dir.	-	1 Hz	
236	Ship Speed	-	1 Hz	
237-238	Compass	-	1 Hz	
239-240	Pitch, roll	-	10 Hz	
244-245	Propeller & Rud.	-	1 Hz	
252-253	Draft	-	0.1 Hz	
255	Event Switch	-	1 Hz	R

* Note Bin #1 Inoperable therefore Channel 31 not sampled.

TABLE C.1 (c)

PATTERN C

IDENTICAL TO PATTERN B - EXCEPT STRAIN GAUGE FILTER CHANNELS 83, 123, 124, 125, 150, 164 and 171 ARE NOT IN PATTERN.

TABLE C.1 (d)

PATTERN D

IDENTICAL TO PATTERN B EXCEPT FILTER ASSIGNMENTS AS FOLLOWS:
(Effective on tape 48)

CHANNEL NUMBER	DESCRIPTION	FILTER CHANNEL NUMBER
130	Strain Gauge	150
131	↓	164
132		171
142		172
145		173
155		174
156		175

TABLE C.1 (e)

PATTERN E

IDENTICAL TO PATTERN B EXCEPT STRAIN GAUGE FILTERS AND ACCELEROMETER FILTERS NOT IN PATTERN.

TABLE C.1 (f)

PATTERN F

IDENTICAL TO PATTERN B EXCEPT: 1) STRAIN GAUGE FILTERS NOT IN PATTERN

2) 198 Shaft Thrust at 500 Hz
208 Shaft Torque at 500 Hz

TABLE C.1 (g) PATTERN G

IDENTICAL TO PATTERN B EXCEPT: 1) ACCELEROMETER FILTERS SAMPLED AT 50 Hz (MODE = PEAK)

2) STRAIN GAUGE FILTERS NOT SAMPLED

TABLE C.1 (h)

PATTERN H

DOPPLER SPEED LOG CALIBRATION

CHANNEL NUMBER	DESCRIPTION	RATE (Hz)	MODE
198	Thrust	10 Hz	Real
208	Torque	↓	↓
201	Propeller Pitch		
209	RPM (Pulse)		
211	RPM (Analog)		
236	Ship Speed		

TABLE C.1 (i)

PATTERN I

IDENTICAL TO PATTERN B EXCEPT: 1) 198 Torque at 100 Hz

2) 208 Thrust at 100 Hz

TABLE C.I (j)

PATTERN J

IDENTICAL TO PATTERN B EXCEPT MID SHIP GAUGES SAMPLED AT 100 Hz (176-179).

ARCTEC CANADA LIMITED

ENGINEERING DESIGN CALCULATIONS

TABLE C.2(a)

JOB NO 734-C

PROJECT M.V. ARCTIC - DATA ACQUISITION

SUBJECT SUMMER - FALL 1981 SHIPPING SEASON
FILTER CHANNELS

SHEET OF

DATE

BY

CHK BY

TAPE # : 1 to 12 FILE # : _____

Transducer	Orig. Ch.	Filt. Ch.	Fc	Rate
For. Heave	1	11		
For. Sway	2	12		
For. Surge	31	13		
S.G.	90	92		
S.G.	110	123		
S.G.	116	124		
S.G.	118	125		
S.G.	137	150		
S.G.	148	171		
S.G.	160	174		
Aft Surge	212	215		
Aft Sway	213	216		
Aft Heave	214	217		

TAPE # : 13 to 47 FILE # : _____

Transducer	Orig. Ch.	Filt. Ch.	Fc	Rate
For. Heave	1	11		
For. Sway	2	12		
For. Surge	31	13		
S.G.	98	83		
S.G.	102	123		
S.G.	103	124		
S.G.	104	125		
S.G.	131	150		
S.G.	132	164		
S.G.	133	171		
Aft Surge	212	215		
Aft Sway	213	216		
Aft Heave	214	217		

ARCTEC CANADA LIMITED

ENGINEERING DESIGN CALCULATIONS

TABLE C.2 (b)

JOB NO 734-C

PROJECT M.V. ARCTIC - DATA ACQUISITION

SUBJECT SUMMER - FALL 1981 SHIPPING SEASON
FILTER CHANNELS

SHEET ... OF ...

DATE ...

BY ...

CHK BY ...

TAPE # : 48 & 49 FILE # : _____

Transducer	Orig. Ch.	Filt. Ch.	Fc	Rate
For. Heave	1	11		
For. Sway	2	12		
For. Surge	31	13		
S.G.	130	150		
S.G	132	164		
S.G.	142	171		
S.G.	145	172		
S.G.	155	173		
S.G.	156	174		
S.G.	212	175		
Aft Surge	213	215		
Aft Sway	214	216		
Aft Heave		217		

TAPE # : _____ FILE # : _____

Transducer	Orig. Ch.	Filt. Ch.	Fc	Rate

TABLE C.3

STRAIN GAUGE STATUS
AS OF September 8, 1981

The following gauges were operational as of this date and make up sampling pattern "A".

19-21
31
33-36
38-43
45-46
49-56
58-59
63-67
69-70
72-76
79-83
85-86
89-91
93-95
97-99
101-106
108
110-118
120-122
126
128
130-134
136-137
139
141-142
144-145
147-149
151-153
155-157
160-163
166-167
169-170
176-179

TABLE C.4

STRAIN GAUGE STATUS
AS OF November 3, 1981

The following gauges were operational as this date. The sampling pattern "A" was modified by adding or deleting as required.

34-36
38-41
43
45
49-56
58-59
63-67
70
72-76
79-81

86
89
91
93-95
97-98
101-106
108
110-111
113
116-118

120
128
130-134
136-137
139
141-142
145
147
151
153
155-157
160-163
166-167
169-170
176-179

NOTE THAT BIN #1
WAS INOPERABLE.

TABLE C.5

STRAIN GAUGE STATUS
AS OF November 8, 1981

The following gauges were operational as of this date. The sampling pattern "A" was modified by adding or deleting as required.

34-36
38-41
43
45
49-59
63-67
70
72-76
79-81
86
89
91
93-95
97-98
101-106
108
110
111
113
116-118
120
126
128
130-142
145-147
151
153
155-157
160-163
166-167
169-170
176-179

TABLE C.6

STRAIN GAUGE STATUS
AS OF November 12, 1981

The following gauges were operational as of this date. The sampling pattern "A" was modified by adding or deleting as required.

34-36
38-43
45
49-59
63-67
70
72-76
79-81
86
89
91
93
95
97-98
101-106
108
110-113
116-118
120
126
128
130-142
145-148
151
153
155-157
160-163
166-167
169-170
174
176-179

TABLE C.7 GAUGE STATUS SUMMARY BY VOYAGE

	BIN NO.	CH. NO.	CARD NO.	ADD. OKAY	SENSOR REF. NO.	SENSOR TYPE	Leg 1 Tapes 1-4	Leg 2 Tapes 5-7	Leg 3 Tapes 8-11	Leg 4 Tapes 12-30	Leg 5 Tapes 31-49	REMARKS
	0	1	1	✓	Heave	ACC	✓	✓	✓	✓	✓	0
	0	2	2	✓	Sway	ACC	✓	✓	?	✓	✓	0
	0	3	3		2005-88	S/G	X	X	X	X	X	
	0	4	4		2015-89	S/G	X	X	X	X	X	
H	0	5	5	✓	Temp.	Therm.	X	X	X	X	X	
H	0	6	6	✓	of Hull	Therm.	X	X	X	X	X	
H	0	7	7	✓	Temp.	Therm.	X	X	X	X	X	
H	0	8	8	✓	of Hull	Therm.	X	X	X	X	X	
	0	9	9			Therm.	X	X	X	X	X	
	0	10	10			Therm.	X	X	X	X	X	
	0	11	11		1790-100	S/G	X	X	X	X	X	R
	0	12	12		1790-101	S/G	X	X	X	X	X	0
	0	13	13		1790-171	S/G	X	X	X	X	X	0
	0	14	14		1810-102	S/G	X	X	X	X	X	0
H	0	15	15		1810-172	S/G	X	X	X	X	X	R
	1	16	0		1810-173	S/G	✓	✓	✓	✓	✓	0
H	1	17	1	✓	1830-174	S/G	X	X	X	X	X	0
	1	18	2		1830-103	S/G	?	X	X	X	X	0
H	1	19	3	✓	1850-104	S/G	✓	✓	✓	✓	✓	0
H	1	20	4	✓	1850-175	S/G	✓	✓	✓	✓	✓	0
H	1	21	5	✓	1870-105	S/G	✓	✓	✓	✓	✓	0
	1	22	6		1870-176	S/G	?/X	X	X	X	X	0
	1	23	7	✓	1890-106	S/G	?	X	X	X	X	0
	1	24	8		1890-177	S/G	X	X	X	X	X	0
	1	25	9		1910-178	S/G	X	X	X	X	X	0
H	1	26	10	✓	1910-107	S/G	✓	✓	✓	✓	✓	0
	1	27	11		1930-179	S/G	?	X	X	X	X	0
	1	28	12		1945-108	S/G	X	X	X	X	X	0
H	1	29	13	✓	1950-109	S/G	X	X	X	X	X	0
	1	30	14		1970-180	S/G	X	X	X	X	X	0
	1	31	15	✓	Surge	ACC	✓	✓	✓	✓	✓	
H	2	32	0	✓	1890-149	S/G	X	X	X	X	X	0
H	2	33	1	✓	1890-150	S/G	?	?	X	X	X	Hamburg
H	2	34	2	✓	1895-92	S/G	✓	✓	✓	✓	✓	R
H	2	35	3	✓	1905-57	S/G	✓	✓	✓	✓	✓	R
H	2	36	4	✓	1910-58	S/G	✓	✓	✓	✓	✓	R
H	2	37	5	✓	1910-59	S/G	X	X	X	X	X	Hamburg
	2	38	6	✓	1910-60	S/G	?	✓	✓	✓	✓	0
	2	39	7	✓	1910-61	S/G	✓	✓	✓	✓	✓	0
	2	40	8	✓	1910-62	S/G	✓	✓	✓	✓	✓	0

M.V. ARCTIC DATA ACQUISITION SYSTEM

DESIGN SYSTEM CHARACTERISTICS

(FOR CURRENT STATUS OF SENSORS REFER TO MOST RECENT REPORT)

	BIN NO.	CH. NO.	CARD NO.	ADD. OKAY	SENSOR REF. NO.	SENSOR TYPE	Leg 1 Tapes 1-4	Leg 2 5-7	Leg 3 8-11	Leg 4 12-30	Leg 5 31-49	REMARKS
H	2	41	9	✓	1910-90	S/G	✓	✓	✓	✓	✓	0
H	2	42	10	✓	1910-91	S/G	?	?	X	X	✓	0
H	2	43	11	✓	1919-151	S/G	✓	✓	✓	✓	✓	0
H	2	44	12		1910-152	S/G	? / X	X	X	X	X	Hamburg
H	2	45	13	✓	1910-161	S/G	✓	✓	✓	✓	✓	Hamburg
H	2	46	14	✓	1910-153	S/G	✓	✓	X	X	X	Hamburg
	2	47	15									Spare
H	3	48	0	✓	1915-63	S/G	X	X	X	X	X	R
H	3	49	1	✓	1925-64	S/G	✓	✓	✓	✓	✓	Hamburg
H	3	50	2	✓	1925-65	S/G	✓	✓	✓	✓	✓	Hamburg
H	3	51	3	✓	1930-66	S/G	✓	✓	✓	✓	✓	Hamburg
	3	52	4		1930-67	S/G	✓	✓	✓	✓	✓	0
	3	53	5		1930-68	S/G	✓	✓	✓	✓	✓	0
	3	54	6	✓	1930-154	S/G	✓	✓	✓	✓	✓	Hamburg
H		55	7	✓	1930-155	S/G	✓	✓	✓	✓	✓	Hamburg
H	3	56	8	✓	1930-156	S/G	✓	✓	✓	✓	✓	Hamburg
H	3	57	9	✓	1935-69	S/G	✓	✓	?	?	✓	Hamburg
H	3	58	10	✓	1935-70	S/G	✓	✓	✓	✓	✓	Hamburg
H	3	59	11	✓	1945-71	S/G	✓	✓	✓	✓	✓	Hamburg
H	3	60	12	✓	1945-72	S/G	X	X	X	X	X	Hamburg
	3	61	13									Spare
	3	62	14		1950-74	S/G	X	X	X	X	X	0
H	3	63	15	✓	1950-75	S/G	✓	✓	✓	✓	✓	0
	4	64	0		1950-76	S/G	✓	✓	✓	✓	✓	0
	4	65	1		1950-77	S/G	✓	✓	✓	✓	✓	0
H	4	66	2	✓	1950-157	S/G	✓	✓	✓	✓	✓	Hamburg
H	4	67	3	✓	1950-158	S/G	✓	✓	✓	✓	✓	Hamburg
H	4	68	4	✓	1955-78	S/G	X	X	X	X	X	Hamburg
H	4	69	5	✓	1955-79	S/G	✓ / X	X	X	X	X	Hamburg
H	4	70	6	✓	1965-80	S/G	✓	✓	✓	✓	✓	Hamburg
H	4	71	7	✓	1970-81	S/G	?	X	X	X	X	0
H	4	72	8	✓	1970-82	S/G	✓	✓	✓	✓	✓	0
H	4	73	9	✓	1970-83	S/G	✓	✓	✓	✓	✓	0
H	4	74	10	✓	1970-159	S/G	✓	✓	✓	✓	✓	Hamburg
H	4	75	11	✓	1970-160	S/G	✓	✓	✓	✓	✓	Hamburg
H	4	76	12	✓	1975-84	S/G	✓	✓	✓	✓	✓	Hamburg
	4	77	13		1985-85	S/G	X	X	X	X	X	0
u	4	78	14	✓	1990-86	S/G	X	X	X	X	X	0
	4	79	15		1995-87	S/G	✓	✓	✓	✓	✓	0
	5	80	0	✓	1830-143	S/G	✓	✓	✓	✓	✓	Hamburg

TABLE C.7 GAUGE STATUS SUMMARY BY VOYAGE - cont.

	BIN NO.	CH. NO.	CARD NO.	ADD. OKAY	SENSOR REF. NO.	SENSOR TYPE	Leg 1 Tapes 1-4	Leg 2 5-7	Leg 3 8-11	Leg 4 12-30	Leg 5 31-49	REMARKS
H	5	81	1	✓	1830-131	S/G	✓	✓	✓	✓	✓	Hamburg
H	5	82	2	✓	1830-144	S/G	✓	X	X	X	X	Hamburg
H	5	83	3	✓	1830-145	S/G	✓	X	X	X	X	Hamburg
H	5	84	4	✓	1830-132	S/G	X	X	X	X	X	Hamburg
H	5	85	5	✓	1835-30	S/G	✓	✓	X	X	X	0
H	5	86	6	✓	1845-31	S/G	✓	✓	✓	✓	✓	Hamburg
	5	87	7		1850-32	S/G	X	X	X	X	X	0
	5	88	8		1850-33	S/G	X	X	X	X	X	R
H	5	89	9	✓	1850-34	S/G	✓	✓	✓	✓	✓	Hamburg
H	5	90	10	✓	1850-35	S/G	✓	✓	X	X	X	0
H	5	91	11	✓	1850-36	S/G	✓	✓	✓	✓	✓	Hamburg
	5	92	12		1850-37	S/G	X	X	X	X	X	0
	5	93	13		1850-133	S/G	✓	✓	✓	✓	✓	0
	5	94	14		1850-134	S/G	✓	✓	✓	✓	X	Hamburg
H	5	95	15	✓	1850-135	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	96	0	✓	1850-136	S/G	X	X	X	X	X	Hamburg
H	6	97	1	✓	1775-250	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	98	2	✓	1775-251	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	99	3	✓	1850-139	S/G	✓ / X	X	X	X	X	Hamburg
H	6	100	4	✓	1775-301	S/G	X	X	X	X	X	Hamburg
H	6	101	5	✓	1775-302	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	102	6	✓	1775-252	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	103	7	✓	1755-253	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	104	8	✓	1755-254	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	105	9	✓	1840-93	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	106	10	✓	1840-94	S/G	✓	✓	✓	✓	✓	0
	6	107	11		1840-95	S/G	X	X	X	X	X	Hamburg
H	6	108	12	NC	1840-96	S/G	✓	✓	✓	✓	✓	0
	6	109	13		1865-39	S/G	X	X	X	X	X	R
H	6	110	14	✓	1865-40	S/G	✓	✓	✓	✓	✓	Hamburg
H	6	111	15	✓	1870-41	S/G	✓	✓	✓	✓	✓	Hamburg
H	7	112	0	✓	1755-304	S/G	✓	✓	✓	✓	✓	Hamburg
H	7	113	1	✓	1870-43	S/G	✓	✓	✓	✓	✓	Hamburg
	7	114	2		1755-305	S/G	✓ / X	X	X	X	X	0
H	7	115	3	✓	1870-140	S/G	✓	X	X	X	X	Hamburg
H	7	116	4	✓	1870-141	S/G	✓	✓	✓	✓	✓	Hamburg
H	7	117	5	✓	1870-142	S/G	?	?	?	?	?	Hamburg
	7	118	6	✓	1875-46	S/G	✓	✓	✓	✓	✓	0
	7	119	7		1885-51	S/G	X	X	X	X	X	R
	7	120	8	NC	1890-52	S/G	✓	✓	✓	✓	✓	Hamburg

TABLE C.7 GAUGE STATUS SUMMARY BY VOYAGE - cont.

	BIN NO.	CH. NO.	CARD NO.	ADD. OKAY	SENSOR REF. NO.	SENSOR TYPE	Leg 1 Tapes 1-4	Leg 2 5-7	Leg 3 8-11	Leg 4 12-30	Leg 5 31-49	REMARKS
H	7	121	9	✓	1890-53	S/G	? / X	X	X	X	X	Hamburg
H	7	122	10	NC	1890-54	S/G	? / X	X	X	X	X	Hamburg
	7	123	11		1890-55	S/G	X	X	X	X	X	0
	7	124	12		1890-56	S/G	X	X	X	X	X	0
	7	125	13		1890-167	S/G	X	X	X	X	X	R
H	7	126	14	✓	1890-148	S/G	✓	✓	✓	✓	✓	R
H	7	127	15	✓	1840-50	S/G	X	X	X	X	X	Hamburg
H	8	128	0	✓	1785-1	S/G	✓	✓	✓	✓	✓	Hamburg
H	8	129	1	✓	1695-315	S/G	? / X	X	X	X	X	R
	8	130	2		1790-3	S/G	✓	✓	✓	✓	✓	R
H	8	131	3	✓	1790-4	S/G	✓	✓	✓	✓	✓	Hamburg
H	8	132	4	✓	1790-5	S/G	✓	✓	✓	✓	✓	Hamburg
	8	133	5	✓	1790-6	S/G	✓	✓	✓	✓	✓	0
	8	134	6	✓	1695-314	S/G	✓	✓	✓	✓	✓	0
	8	135	7		1790-121	S/G	X	✓	✓	? / ✓	✓	R
H	8	136	8	✓	1790-122	S/G	✓	✓	✓	✓	✓	Hamburg
H	8	137	9		1790-123	S/G	✓	✓	✓	✓	✓	0
H	8	138	10	✓	1790-124	S/G	✓	✓	✓	/ ✓	✓	Hamburg
H	8	139	11	✓	1695-313	S/G	✓ / ?	✓	✓	✓	✓	0
H	8	140	12	✓	1805-9	S/G				/ ✓	✓	0
	8	141	13		1695-263	S/G	✓	✓	✓	✓	✓	0
	8	142	14		1810-11	S/G	✓	✓	✓	✓	✓	R
	8	143	15		1695-262		X	X	X	X	X	Spare
	9	144	0		1810-12	S/G	✓	X	X	X	X	R
H	9	145	1	✓	1810-13	S/G	✓	✓	✓	✓	✓	0
	9	146	2		1810-125	S/G	✓	✓	✓	/ ✓	✓	R
H	9	147	3	✓	1810-126	S/G	✓	✓	✓	✓	✓	Hamburg
H	9	148	4	✓	1810-127	S/G	✓	✓	✓	✓	✓	Hamburg
H	9	149	5	✓	1810-128	S/G	✓	✓	X	X	X	0
	9	150	6		1810-14	S/G	X	X	X	X	X	Hamburg
	9	151	7		1695-261	S/G	✓	✓	✓	✓	✓	0
H	9	152	8	✓	1715-312	S/G	✓	✓	X	X	X	0
H	9	153	9	✓	1825-17	S/G	✓	✓	✓	✓	✓	0
	9	154	10		1715-311	S/G	?	?	X	X	X	R
H	9	155	11	✓	1830-19	S/G	✓	✓	✓	✓	✓	R
	9	156	12		1830-20		✓	✓	✓	✓	✓	R
H	9	157	13	✓	1715-310	S/G	✓	✓	✓	✓	✓	Hamburg
H	9	158	14	✓	1830-22	S/G	?	X	X	X	X	Hamburg
	9	159	15		1715-260		X	X	X	X	X	Spare
H	10	160	0	✓	1830-23	S/G	✓	✓	✓	✓	✓	Hamburg

TABLE C.7 GAUGE STATUS SUMMARY BY VOYAGE - cont.

	BIN NO.	CH. NO.	CARD NO.	ADD. OKAY	SENSOR REF. NO.	SENSOR TYPE	Leg 1 Tapes 1-4	Leg 2 5-7	Leg 3 8-11	Leg 4 12-30	Leg 5 31-49	REMARKS
H	10	161	1	✓	1715-259	S/G	✓	✓	✓	✓	✓	Hamburg
H	10	162	2	✓	1715-258	S/G	✓	✓	✓	✓	✓	0
H	10	163	3	✓	1830-26	S/G	✓	✓	✓	✓	✓	Hamburg
	10	164	4		1830-27	S/G	X	X	X	X	X	0
	10	165	5		1830-28	S/G	X	X	X	X	X	0
H	10	166	6	✓	1735-309	S/G	✓	✓	✓	✓	✓	0
H	10	167	7	✓	1735-308	S/G	?	✓	✓	✓	✓	0
	10	168	8		1825-192	S/G	X	X	X	X	X	Hamburg
H	10	169	9	✓	1735-257	S/G	✓	✓	✓	✓	✓	Hamburg
H	10	170	10	✓	1735-256	S/G	✓	✓	✓	✓	✓	0
	10	171	11		Temperature Therm.		X	X	X	X	X	
	10	172	12		1755-306		X	X	X	X	X	
	10	173	13		1830-129	S/G	X	X	X	X	X	Hamburg
	10	174	14		1830-130	S/G	X	X	X	X	X	R
	10	175	15									Spare
	11	176	0		1035-	S/G	✓	✓	✓	✓	✓	
	11	177	1		1045-	S/G	✓	✓	✓	✓	✓	
	11	178	2		1055-	S/G	✓	✓	✓	✓	✓	
	11	179	3		1055-	S/G	✓	✓	✓	✓	✓	
	11	180	4		1055-	S/G	X	X	X	X	X	
	11	181	5		1055-	S/G	X	X	X	X	X	
	11	182	6		1055-	S/G	X	X	X	X	X	
	11	183	7		1055-	S/G	X	X	X	X	X	
	11	184	8		1065-	S/G	X	X	X	X	X	
	11	185	9		1075-	S/G	X	X	X	X	X	
	11	186	10									Spare
	11	187	11		Bubbler	Press.	X	X	X	X	X	sh
	11	188	12		Bubbler	Press.	X	X	X	X	X	sh
	11	189	13									Spare
	11	190	14									Spare
	11	191	15									Spare
	12	192	0									Spare
	12	193	1									Spare
	12	194	2									Spare
	12	195	3									Spare
	12	196	4		Rudder Torque		✓	✓	✓	✓/X	X	Spare
	12	197	5									Spare
	12	198	6	✓	Thrust	Renk	✓	✓	✓	✓	✓	
	12	199	7	✓	Fuel Rack Pot.		✓	✓	✓	✓	✓	
	12	200	8	✓	Rudder Res. Pot.		✓	✓	✓	✓	✓	

TABLE C.7 GAUGE STATUS SUMMARY BY VOYAGE - cont.

BIN NO.	CH. NO.	CARD NO.	ADD. OKAY	SENSOR REF. NO.	SENSOR TYPE	Leg 1 Tapes 1-4	Leg 2 5-7	Leg 3 8-11	Leg 4 12-30	Leg 5 31-49	REMARKS
12	201	9	✓	Prop. Res.	Pot.	✓	✓	✓	✓	✓	See Note
12	202	10	✓	Rud. D.P.	Press.	?	?	?	?	?	51
12	203	11	✓	Prop. D.P.	Press.	?	?	?	?	?	
12	204	12	✓	Bub.Stat.	Relay	X	X	X	X	X	
12	205	13	✓	Bub.Stat.	Relay	X	X	X	X	X	
12	206	14	✓	Bub.Stat.	Relay	X	X	X	X	X	
12	207	15									Spare
13	208	0	✓	Torque	T.M.	✓	✓	✓	✓	✓	See Note
13	209	1									Spare
13	210	2									Spare
13	211	3		shaft RPM (Analog)		✓	✓	✓	✓	✓	Spare
13	212	4	✓	Surge	ACC	X	X	X	X / ✓	✓	See Note
13	213	5	✓	Sway	ACC	✓	✓	✓	✓	✓	See Note
13	214	6	✓	Heave	ACC	✓	✓	✓	✓	✓	See Note
13	215	7									Spare
13	216	8									Spare
13	217	9									Spare
13	218	10									Spare
13	219	11									Spare
13	220	12									Spare
13	221	13									Spare
13	222	14									Spare
13	223	15									Spare
14	224	0	✓	Visibility	Mar.	✓	✓	✓	✓	✓	Miles
14	225	1	✓	Cloud C.	Mar.	✓	✓	✓	✓	✓	Tenths
14	226	2	✓	Ice C.	Mar.	✓	✓	✓	✓	✓	Tenths
14	227	3									Spare
14	228	4	✓	Bar.Press.	Mar.	✓	✓	✓	✓	✓	m bars
14	229	5	✓	Bar.Press.	Mar.	✓	✓	✓	✓	✓	m bars
14	230	6	✓	Bar.Press.	Mar.	✓	✓	✓	✓	✓	000 m bars
14	231	7	✓	Air Temp.	Mar.	✓	✓	✓	✓	✓	C
14	232	8	✓	Rel.Humid.	Mar.	✓	✓	✓	✓	✓	%
14	233	9	✓	Wind Speed	Tech.	✓	✓	✓	✓	✓	
14	234	10	✓	Wind Dir.	Synchro.	✓	✓	✓	✓	✓	°
14	235	11									Spare
14	236	12	✓	Ship Speed	Doppler	✓	✓	✓	✓	✓	
14	237	13	✓	ShipHead:S	Pot.	✓	✓	✓	✓	✓	
14	238	14	✓	ShipHead:C	Pot.	✓	✓	✓	✓	✓	
14	239	15	✓	Pitch	Pot.	✓	✓	✓	✓	✓	
15	240	0	✓	Roll	Pot	✓ / ?	X	X	✓	✓	

TABLE C.7 GAUGE STATUS SUMMARY BY VOYAGE - cont.

BIN NO.	CH. NO.	CARD NO.	ADD. OKAY	SENSOR REF. NO.	SENSOR TYPE	Leg 1 Topos 1-4	Leg 2 5-7	Leg 3 8-11	Leg 4 12-30	Leg 5 31-49	REMARKS
15	241	1		Engine RPM		✓	✓	✓	✓	✓	
15	242	2	✓	Shaft RPM	Tech.	✓	✓	✓	✓	✓	
15	243	3									Spare
15	244	4	✓	Prop.Com.	Pot.	✓	✓	✓	✓	✓	
15	245	5	✓	Rud.Com.	Pot.	✓	✓	✓	✓	✓	
15	246	6									Spare
15	247	7									Spare
15	248	8									Spare
15	249	9									Spare
15	250	10									Spare
15	251	11									Spare
15	252	12	✓	Draft(fwd)	Mar.	✓	✓	✓	✓	✓	
15	253	13	✓	Draft(aft)	Mar.	✓	✓	✓	✓	✓	
15	254	14									Spare
15	255	15	✓	Event	Switch	✓	✓	✓	✓	✓	

TABLE C.8 ANALOG RECORDER LOG

DATE	TAPE FM-1	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	FM RECORDER TAPE & COUNT	FM RECORDER MODE	
Oct.23/81				Calibrations		FM1-00		
				Channel 1 Voice 2 Thrust 1.44 tonnes/v 3 Prop.Pitch 0.462°/v 4 Torque 16 ft lbs/v 5 Shaft RPM 1 pulse/rev. 6 7 Ø 8		111		
				16 kts Speed Calm Seas 20 kts Wind	1544 GMT	0111 (3 3/4 ips)		
						0194		
				Unloading Lips people in Aberdean - Speed 4 kts and falling	1600 GMT	194(3 3/4 ips)		
						353		
						353(15/16 ips)		
					1730 GMT	584		
Oct.26/81				Heavy Seas - North Atlantic	930	584(3 3/4 ips)		
					940	673		
					940	675(15/16 ips)		
					1004	751		

TABLE C.9 ANALOG RECORDER LOG

DATE	TAPE FM-2	FILE	SHIP SPEED	ICE & EVENT	PERIOD (Min.)	TIME(GMT)	FM RECORDER TAPE & COUNT	FM RECORDER MODE	RECORDER EVENT NUMBER
Nov.4/81			2.5 kts	6/10 1st yr, 3/10 myr	30	2116:45 2146:12	ON 0000 OFF 0057		1
Nov.5/81			0-4 kts		11	1313 1323	ON 0057 OFF 0086		2
Nov.6/81			2.8-5.6	Backing and Ramming	6	1524 1529:56	ON 0086 OFF 103		3
			1-3 kts	Backing and Ramming	31	1602 1633:19	ON 103 OFF 188		4
			0-4 kts	Backing and Ramming	41	1850:07	ON 188		5
			2-6 kts	Continuous Transit 9/10 1st yr, 1/10 MYR at 4-6 ft		1918:02 1931:10	ON OFF 305		
			1.5 kts	Ram - MYR	3	1944:38 1947:22	ON 305 OFF 317		6
			2 kts	Impact MYR	2	2027:19 2029:19	ON 317 OFF 323		7
			4 kts		25	2130:16 2155:56	ON 323 OFF 405		8
Nov.7/81			2.6 kts	6-8" 1st YR	2	1542:25 1544:46	ON 405 OFF 411		9
Nov.7/81			2-4 kts	Backing and Ramming MYR	44	1616:30 1704:40	ON 411 OFF 538		10
			5-8 kts	Continuous Transit 1st yr 12" Ice 2" Snow	9	2027:15 2036:30	ON 538 OFF 552		11

con't.

TABLE C.9 ANALOG RECORDER LOG CONTINUED

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	PERIOD (Min.)	TIME(GMT)	FM RECORDER TAPE & COUNT	FM RECORDER MODE	RECORDER EVENT NO.
Nov.8/81			8 kts	Continuous Transit 6/10 - 8/10 Cov. 1st yr with odd MYR	60	1856 1951:30	ON 636 OFF 816		12
			6-9 kts	Backing and Ramming 1st and 2nd yr loose pack 8/10 coverage	60	2034:33 2102 2136:42	ON 816 921 1053		13
			13 kts	1st yr ice Admiralty Inlet		2355:12	ON 1053 ↓ ↓ TO END OF TAPE		14

TABLE C.10

COMPUTER/VIDEO LOG

(35 pages)

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Oct.17/81	8	00	15 kts	Open Water, No roll, off Coast of Scotland.		OFF		
				- System Check	0715			
				Ran Pattern A for 20 minutes and then system crashed.	0735			
		00*	15 kts	Same Envir. Conditions - Ran same Pattern A with cables disconnected breaking the loop - Ran for 48 minutes without error.				

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Oct.17/81	9			Re-used at later date in Ice conditions.				

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Oct.17/81	10			Re-Used at Later Date in Ice Conditions				

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Oct.18/81	11	00	Various	Entering Port of Antwerp - All Channels 1-175 sampled at 10Hz each - 35ms period - loop "open" (Bus) - Real Mode Only No system problems encountered despite power "brown-outs". As noted by scope dimming and sound of vacuum on Mag.Tape units "Falling" All gauges dead on zero before start of scan - Bin #1 without MC so level will ride at = 4.5 volts EOT	1743

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Oct.22/81	12	00	10 Kts	System check while leaving ANTWERP at 10 kts		Off		
		01	10 kts	Mod. on Sampling rate				
		00*		Maneouvering while last port pilot left ship				
Oct.23/81	12	00*	11.8 kts	LIPS TESTS "Combination Mode" at 9 giving 450 RPM and 5.3 ahead PITCH	1000 GMT			
			12.9 Kts	LIPS TEST OFF COMB MODE 450 RPM & 3.8 ahead . S7 setting	1013			
				Pitch - 8 setting	1014			
			13.9 & Rising	COMB. MODE @ 9 setting	1015			
			14.8		1017			
			15.7		1024			
		00*	4 kts & Dropping	PREPARING TO UNLOAD "LIPS" PEOPLE @ ABERDEEN	1600			
		01		CRASHED - SYS. RESTART	1637			
		02		REMOVED PULSED RPM	1640			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.3/81	13	00		PANCAKE YOUNG ICE & OPEN WATER ON	1326			
				OFF	1331			
		01	15 Kts	9/10 PANCAKE ON	1516	2-113	72HR	
				1/10 6-8" 1ST YR & GROWLERS	1533			
		02		REMOVED VIS., CLOUD COVER CHANNELS AND ADDED FILTERS 83 AND 164	1533	2-118		
		03		GARBAGE	1543	2-123		
		04	16 kts	LOW SAMPLING RATE - REMOVED AFT ACC. FILTERS FROM PATTERN	1610	2-131		
				2/10 - 9/10 COVERAGE YOUNG ICE	1626	2-136		
		05	10 kts	8/10 COVERAGE 6/10 YOUNG ICE	1636	2-144		
				2/10 1st Yr 15"				
				STBD IMPACT OFF	1710	2-150		

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT		TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
NOV.3/81	13	05	10 kts	8/10 COVERAGE 1st yr. 8 - 18" and Pancake @ 6"	START	1636	VIDEO TAPE #2 2-144	72 HR.	
		05	7 kts	"	STOP	1725 1749	2-149 -		
		06	10 kts	8" 1st yr. ice 7/10 coverage	START	1851	2-172		
			8 kts	"	Cut eng. from 10 kts spd. for large ice floes	1856	2-173		
	14	00	8 kts	"	START/STOP(3Min)	1955			
		01	6-7 kts	10/10 coverage	START @ High sampling rate	1958	2-191		
		02	8 KTS		STOP STOP	2030 2024			
Nov 4/81	15	00	8 kts	PRIMARILY OPEN WATER 0.5/10 NEW & 1st YEAR ICE	START TIME (TV icing " off) low sampling rate	1542	OFF AT 444		PATTERN C
			14 kts	"	LARGE 2nd yr in 1st yr ice flow STBD hit(2nd-4', 1st yr - 1')	1624			
			14 kts	"	Cleared ice on TV window	1640	2-444 (ON)		

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.4/81	15	00	10 kts slowing to 7 kts	OPEN WATER ENG. SLOWED APPROACH ON MYR	1725	2-452	72 HR	
	15	00*	2 kts - 0	MY. YR. ICE FLOW, REVERSED THRUST - HIGH SAMPLING RATE	1736	2-455		
				BACKING OFF MY. FLOE 2 KTS REVERSE	1745	2-458		
		00	0	OFF	1748			
		01	0 kts, swinging to stbd.	RAM TRACK IN VIDEO ON	1750	2-461		
		01		LOST 4 GAUGES(128,131,132,137)OFF	1756	2-464		
		02	6 kts	REDUCED SAMPLING RATE	1807	2-470		
			6 kts	HIT SMALL 1st YR FLOE	1809	2-473		
			5 kts	LOOSE PACK ICE	1814	2-476		
				EOT WRITTEN	1845			
Nov.4/81	16	00	8.6 kts	LOOSE PACK - START NEW TAPE 1/10 COV.	1900	2-508		
				STOP	1909	2-517		
		00*	1 kt	START	2031	2-525		
		01	3.5 kts	6/10 1st yr. 3/10 myr. RE-START @ HIGH SAMPLING RATE	2050	2-528		PATTERN B

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.4/81	16	01	2.5 kts	6/10 1st 3/10 myr FOUND FM REC SWITCH ON,	2054	2-529	72 HR	PATTERN B
		"	"	" FELT IMPACT	2056			
				FINISHED BALANCING CH's 128,131,132,137, 150,164 CH 139 NFG NOW (REQ.COARSE RANGE) NOTE - FM REC SUPPLY REEL FULL ∴ 4½ HRS TO GO	2116:45			
			0	EOT WRITTEN	2146:12	2-538		
Nov.4/81	17	00	2.5 kts	" START NEW TAPE	2157	2-540		
				STOP	2326			
Nov.5/81	17	00*	4 kts	" START	1312 GMT			
			0 kts	STOP	1323			
		01						

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT		TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.6/81	18	00	0-2 kts	BRASH FROZEN ABOUT SHIP DURING NIGHT	START TAPE	1509	2-756	72 hr	
				BACKING OFF		1515			
			1.8 kts	FORWARD INTO LAST NIGHTS SLOT		1516			
			1.3		BACKING OFF & WAITING FOR HELICOPTER	1517			
					TAPE STOP	1519			
		01	2.8 kts		TAPE START				
			5.6 kts			1524		18 hr	
					BACKING OFF FROM RAM	1529:56	2-761	72 hr	
	BALANCED GAUGES		3.2 Kts	MYR FLOW	RAMMING	1557	OFF		
					LOST PROG.	1602	ON		
Nov.6/81	18	00*	2.9 kts	RAM	ST. COMP. (RE LOADED PROG)	1607	(ON)		
				BACKING IN MYR. (2.3 kts)		1608	(ON)		
			3.6 kts	RAMMING MYR.		1611	2-766	18 hr	

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT		TIME(GMT)	VIDEO		
							TAPE & COUNT	MODE	
Nov.6	18	00 (con)	1.8 kts	MYR	BACKING	1613	768	72HR	
			3.4 kts	"	RAMMING	1615			
					PORT YAW				
				"	BACK	1619	771		
			2.9 kts	"	RAMMING	1621	772		
			1.5 kts	"	BACKING	1624			
			2.9 kts	"	RAM	1625			
			1.2 kts	"	BACKING	1629	776		
					ALTHOUGH GAUGES WERE BALANCED, ALL LOG PRINTOUTS INDICATE THIS IS NOT THE CASE!)				
		01			REDUCED SAMPLING RATE TO LOW LEVEL	1633:19	779		

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT		TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.5/81	19	00	0-7kts	1st yr 1 ft	DOPPLER ACC. CAL START	1928		72 HR	
					FINISH	2032	2-745		
		01			DOP. CONT. START	2034			
					STOP	2028			
Nov.6/81	19	00*		RAM FLOE MYR FLOE		1805			
				RE-START (3rd)	CLEARING RUBBLE FROM TRACK - RAM EDGE - MYR				
		01		MULT.YR. RAM	START	1831	VIDEO TAPE #3 3-010	18 hr	
				LARGE PIECE MYR on STARBOARD CAM.		1833:59			
				BACKING		1836			
				RAM	MYR STB CAM.	1837:28			
			2.2 kts	BACKING					
			3 kts	RAMMING BUT COMP CRASHED		1840:55			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.6/81	19	00*	3.4 kts	MYR STB CAM RAMMING	1850:07	32	18 hr	
			1 kts	BACKING	1852:			
			4 kts -3 kts @ RAM	RAM, MOSTLY RUBBLE MTLT YR PORT CAM.	1855:29			
			1.4 kts - 3 kts	BACKING	1857:27	3-42		
			4 - ? kts	RAM (Jumping around alot)	1900			
		00*		RAM (MISSED MOST)	1910:50			
		00*	4 kts	RAM	1915	3-64		
			2.4 kts		1916			
			1 kts	LARGE MYR PORT CAM.	1916:41			
			4 kts	1st yr 2 in. SNOW 8 in. 1ST YR	1918:02			
			5.2 kts	" "	1919:51			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov. 6/81	19		6 kts	LARGE SNOW COVER CONTINUOUS BREAKING	1920	3-72	18	
			2 kts	ODD MYR @ 4-6 FT IN 1ST YR	1923:11			
			4 kts	CONTINUOUS BREAKING				
			3 kts	MYR STICKING STARB. SIDE	1926:15	3-78	18	
			4 kts	MYR STB. CAM. (CLOSE TO MOUNT) (HIT MOUNT)	1926:55			
			5 kts	CONTINUOUS ICE 1st - 1/10 2ND YR	1927:48			
			7 kts	INTO LOUIS TRACK	1929:59			
				STOP	1931:10			
	20	00	10 kts	CONTIN. 1ST YR ICE	1933:38	3-87	18	
			8 kts	1ST YR THIN				
			2 kts	1ST YR, SOME MYR	1942:50			
			1 kts	MYR PORT CAM.	1943:00			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT		TIME(GMT)	VIDEO		
							TAPE & COUNT	MODE	
		00	1.5 kts	MYR		1944:38		18 HR	
			2.8 kts	PUSHING LOOSE PACK ICE AHEAD IN LEADS		1949:03		↓	
					STOP	1950			
Nov.6/81	20	01	4.5 kts	LOW SAMPLING RATE GEN. - INCREASED THR. & Q. CONT. ICE TRANSIT 1ST YR 9/10 COV	START	1951	3-111	18 HR	
			4 kts	WITH LEADS		2019	3-141		
	20	01	3.4 kts	COMING INTO MYR RUBBLE		2025:39	3-148		
			2.2 kts	MYR JUST OFF PORT		2027:19			
			2 kts	IMPACT		2028			
				PUSHING MYR, RIDGING AROUND CIRCUMF.		2029:19			
				BACKING OFF					
				RAM				↓	

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.6/81	20	00*	5.7	CRASHED RESTART @ 2047:30 LOOKING FOR MYR TO RAM	20.47:30	3-174	18	
			7 kts	LEADS OPENING	2050:39			
				YAW TO PORT SYSTEM CRASHED	2051:36			
Nov.6/81	20	00*	3.7 kts	RESTART FOLLOWING LEAD	2054:30			
				FEEL SMALL IMPACT - STILL FOLLOWING LEAD	2056:50			
				OFF	2130:36		18	
	21	00	4 kts	COMP. ON	2131:50			
				1st MATE WARNING ON ICE AHEAD	2146:29			
	21	00	4 kts 3 - 1 kt	PUSHING MYR FLOW	2155:56			
			0.kts	SHIP STOPPED REVERSE				

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.7/81	22	00		START / H S R(High Sampling Rate)	1443	3-646	18	
			4 kts	RAM 16' MYR BUBBLER ON	1447			
			2.4 kts	LONG RAM MYR BUBBLER ON	1449			
			1kt - 3kt	BACKING UP WITH BUBBLERS IN MYR RUBBLE	1457			
			3.2 kts	STARTING RAM (BUBBLER)	1459	3-656		
			3.0 kts	STARTING RAM				
			1.5 kts	END OF RAM (WITH BUBBLER)	1503			
				TAPE STOP	1508			
		01	2 kts	FOLLOWING LEAD	1517			
				BACKING UP FROM RAM c/w BUBBLER	1517:56 1518:11	3-667		
			3 kts	RAM INTO LEAD	1520			
				COMP CRASHED	1524			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
NOV.7/81	22	00*	1.8 kts	CONTINUOUS BREAKING	1525	3-672	18	
			2.5 kts	CONTINUOUS BREAKING	1527			
			3.3 kts	OPEN WATER YAW TO PORT FROM STB RAM	1529			
			3.7 kts	LOOSE PACK FOLLOWING LEADS				
			4 kts	SMALL MYR FLOE STBD. IMPACT	1532			
			4 kts	PORT IMPACT YAW TO STBD	1533			
				STOPPED TAPE	1534			
		00*	5 kts	STARTED	1536			
				LOW SAMPLING RATE LOOSE PACK MYR 1ST YR NEW ICE 2/10 4/10 1/10				
			2.6 kts	CUT ENG ON APPROACH TO FLOE 6-8" 1st YR	1542:25 1544:46	3 - 681	18	

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.7/81	22	00	4.5 kts	LARGE MYR FLOE DIRECT HIT BOW PITCHED UP	1605	3-695	18	
			1 kt	BACKING	1609			
	22	00*	3.8 kts	RESTART HIGH SAMPLING RATE	1612	3-699	18	
			0	FOR. THRUST FOR RAM	1615:05			
			2.5 kts 3.4 kts	RAM	1616:30			
				BACKING	1618			
			3.5 kts	RAM MYR	1620:34			
			1 kt	BACKING				
			3.6 kts	RAM	1625:03	3-707	18	
			3 kts	RAM (AGAIN)	1630:09		18	
			3.2 kts	RAM (AGAIN)	1634:48			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.7/81	23	00	3.3 kts	MYR FLOE RAM	1639:38	3-715	18	
			3.5	RAM IMPACT	1642:49			
					1655:19			
					1700:17			
				MISSED RAM WITH - COMP. DWN. DARLENE ON FLOE				
	24	00	3 kts	RAM	1706:50			
		00*	1.9 kts	RAM IMPACT	1720:39	3-738	18	
				RAM IMPACT	1722:46		18	
			2 kts	RAM IMPACT NO BUBBLER CUT THRUST LATE IN RAM	1724:32		18	
			2 kts	CUT THRUST BEFORE IMPACT	1726:39		18	
			2 kts	POOR IMPACT				
			2 kts	POOR IMPACT	1730			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.7/81	24	00	1 kt	BACKING	1732:43	3-745	18	
			2.3 kts	RAM	1735:58			
				BACKING	1738:08			
			2 kts	RAM AFTER STBD YAW THROUGH 1st yr	1744:33		18	
			2.8 kts	BACKING THROUGH 1st YR TRACK FROM RAM	1746:19			
			2.2 kts	POS. MILLING FORWARD IN 1st YR	1749:45		18	
			2.7 kts	REVERSE THRUST TO SLOW FOR IMPACT - PORT IMPACT WITH YAW TO STARBOARD STILL NO BUBBLER	1752:59		18	
			2.5 kts	RAM IMPACT MYR PORT WITH STBD YAW	1756:51		18	
			2 kts	PORT IMPACT YAW TO STBD	1800		18	

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
NOV.7/81	24	00*	5 kts	1ST YR ICE 8 - 10" STBD SIDE LOWER SAMP. RATE HIGH RATE ON TORQUE	1808:10		18HR	
			3.8 kts	PORT IMPACT STARBOARD YAW	1810:02			
			1.7 kts	BACKING THROUGH 1ST YR RUBBLE	1812:33		18	
			2.2 kts	RAM GLANCING IMPACT YAW STBD PORT IMPACT	1817:35			
			3 kts	PORT IMPACT STARBOARD YAW	1822:24		18	
			5 kts - 2.4 kts	MYR OFF STARB	1827:30			
			BACKING	SHIP VIB. IN REVERSE THRUST	1828			
			3 kts	RAMMING 2 YR	1832			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov. 7/81	24	00	2.5 kts ?	BACKING THROUGH TRACK RAM	1834		18	
			1.2 kt	BACKING AGAIN	1837			
			1 kt	LOOSE PACK ICE - SHIP VIBRATION MANEUVERING	1845			
			2.5 kt	RAM, REV. THRUST VIBRATION POOR RAM				
			2 kts	RAM - POOR ONE	1851			
Nov.7/81	25	00		TORQUE & THRUST @ HIGH SAMPLING RATE - 1200 channels/sec	2009	3-803	72	
			2.5 kts	RAM GOOD (CRASHED) Computer	2016:16 2016:50	3-804	18	
		00*	2 kts	RAM # 2, POOR, FLOE SPLIT, YAW TO STARBOARD				
				BACKING	2021			
		00		EOF				
		00*	5-6 kts	CONTINUOUS TRANSIT 1st YR	2027:15	"	18	
			8 kts	LEVEL ICE 12" + 1.5" SNOW	2030		18	
			SLOWING TO 5 kts	ODD OPENING & Cracks				

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.7/81	25	00*	6.5 kts	LOOSE PACK ICE	2036:30		18	
			7 kts	BACK INTO CONTINUOUS SHEET	2038			
				COMP. DOWN	2040:00			
				TAPE OUT LIGHT CAME ON AND LOST PROGRAM				
Nov.7/81	25	00*	2.4 kts	IN TRANSIT	2055			
			2.5 kts	IN TRANSIT	2113	3-834	72	
				COMP. DOWN (LOST PROG)	2113 +			
		00*		" "	2122			
		00*	1 kt	COMP. DOWN				
						VIDEO TAPE #4		
Nov.8/81	26	00		BREAKING OUT FROM NIGHT & TWO RAMS INTO MYR FLOE	1412	215	72	
			2 kt	RAM STBD SIDE	1436	222	18	
			2.6 kt	CONT. FORWARD THROUGH RUBBLE				
			2.5 kts	RAM IMPACT FOLLOWED BY YAW TO PORT	1439:08			
			1.2 kts	1 ST YR WITH 5" SNOW ON 9" ICE	1442			
					1444			
				3 or 4 GOOD RAMS WHILE SORTING OUT S.G. DATA WITH JOHN				

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.8/81	26	00	3 kts	RAM INTO FLOE BUT PRIMARILY 1ST YR ICE	1512:00		18 HR	
				ICE MILLING, AFTER RAM IN 8/10 1 ST YR, 1/10 2ND, 1/10 MYR	1516:48			
			2 kts	STEAMING ON TO MYR FLOE BUT SLOWED TO HALT BY 1ST YR RUBBLE	1520			
			1.5 kts	BACKING	1522			
			1.7 kts	RAM - POOR AGAIN	1524:35			
			1 kt	BACKING	1525			
			3 kts	BACKING, OUT OF TRACK	1529	4-274		
			1.5 kt	STBD IMPACT WITH MYR ON TRACK EDGE, YAW TO PORT	1535	4-231		
			2 kts	BACKING OUT OF TRACK	1539		18	
			2 kts	RAM APPROX. STBD IMP, YAW TO PORT	1548			
				BACKING & RAMMING TO GET TO LARGE MYR FLOES	1552	4-295	18	
				STOPPED TAPE	1601	4-303		
		01		RESTART AFTER GAUGES BAL. BACKING AND RAMMING	1629	4-328		
				RAM @	1640			
				RAM @	1650			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
NOV.8/81	26	01	4-5 kts	CONT. TRANSIT TO ICE FLOE FOR CAMERA REMOVAL - ICE IS 1st YR 8"	1715		18	
			4.5 kts	LOOSE PACK	1728			
				STOPPED AT	1739:54	4-386	18	
	27	00	8 kts	CONTINUOUS TRANSIT	1855	4-401		
				1st yr 8/10, 1/10 2nd, 1/10 MYR	1856			
				1st yr 6/10-8/10 COV. MIXED WITH 1/10 2nd yr and ODD MYR	1951:30	4-443	18	
			8 kts	CONT.TRANSIT BUBBLER ON 6/10 1st, 1/10 2nd mixed with MYR 8/10-10/10 cov.	2012	4-459	18	
	28	00	10 kts	SAMPLING FWD. ACC. & TORQUE & THRUST @ 4 RATE 1200 c/s				
			9 kts	CUT ENG. FOR LARGE FLOE CAME UP @ 5.6 kts	2034:33			
			6 kts	CUT ENG. AGAIN FOR 2nd YR FLOE WITH RIDGING IMPACT	2037 2038:30			
			3 kts	IMPACT WITH SOMETHING	2043			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
NOV.8/81	28	00	7.5 kts	1st & 2nd YR LOOSE PACK 8/10 cov. EOT	2102	4-497	18	
	29	00	10 kts	SHIP VIBRATING IN 1st YR LOOSE PACK	2134 2136:42			
		01	11 kts	INCREASED SAMPLING	2137	4-520	18	
		00*		RATE ON ACC. FORWARD STOP TAPE	2204			
			DOWN TO 6 kts FROM 10 kts	RESTART, SAMPLING PATTERN AS ABOVE	2242			
			11 kts	LARGE 2nd YR OFF STARBOARD APPROX. 2	2300			
			4.5 kts	DOPPLER CAL. 2,3, 4 kts	2322:52			
			2.4 kts	LEVEL 1st YR ICE IN ADMIRALTY INLET 1-2 ft.	2334			
			13 kts	BACK UP TO SPEED IN 1ST YR ICE	2355:12	4-610		
	30			VTR OFF, Maneouvering into Nanisivik Dock.	0402			

TABLE C.

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.11/81	31	00		LEAVING NANISIVIK	2052:30	4-758	72	
			13.7 kts	LOOKING FOR LOUIS TRACK UP ADMIRALTY INLET	2256	4-773		
			12.5 kts	ENTERING 1ST YR WITH SHIP VIBRATION	2300			
			9 kts	AGAIN SHIP VIBRATION LOUIS TRACK NOT YET FOUND, LOUIS 6 MI. AHEAD	2330			
				SOPPPED TAPE	2326			
	32	00	9.0 kts	RESTARTED WITH NEW TAPE	2341:31	779	72	
				- STILL IN 1st YR WITH RIDGING AND 9/10 COV. BUBBLERS ON SINCE NANISIVIK AND WILL BE LEFT ON UNTIL CLEAR OF ICE				
				VIBRATION				
Nov 12/81				@ 0045 SHIP HIT MYR STB & HEADED PORT SIDE, INTO LARGE MYR - LOST 94 AND 89 GAUGES	2348:54 0024:45			
			4.5 kts	1st yr. WITH GROWLERS	0105	791		
				END TAPE	0219:25			

TABLE C.

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.12/81	33	00	4-6kts	START NEW TAPE LOUIS REPORTS LARGE MYR PIECES IN 1ST YR WHICH THEY ARE PRESENTLY PICKING THEIR WAY THROUGH - ARCTIC STILL HAVING TROUBLE FINDING LOUIS TRACK IN 1st YR & MYR ICE	0258	4-806	72	
			8-10 kts	SPEED UP TO 10 kts BRIEFLY IN 1st YR ICE				
				CUT ENGINES AT	0309			
				HARD STBD WITH SOME MILLING - LARGE BERG OFF PORT - LOUIS TRACK OFTEN LOST	0414			
				ICE MILLING	0420 0425	4-818	72	
				TAPE END @ 0539	0504:9			
Nov.12/81	34	00	5-9 kts	FOLLOWING TRACK OF LOUIS WITH FEW PROBLEMS (ODD DIFFIC. HAIRPIN TURN)	0540			
				MYR IMPACTS	0652 0726 0735			
			6.9 kts	IN LOUIS TRACK	0802	4-846		
			3 kts	REVERSE THRUST - END OF TAPE	0831			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.12/81	35	00	1 kt	START TAPE	0835	4-758	72	
				STOP TAPE (EOT WRITTEN)	1116			
	36	00	0 kt	START: SHIP STARTING UP AFTER SHORT SHUT DOWN WAITING FOR LOUIS TO GET AHEAD	1205	4-787	72	
			1-3 kts	BACKING & RAMMING	1216-1304			
				COULD SEE BOW BEND & OSC.	1308			
				STBD SHEAR TO PORT	1818			
				MILLING (HEAVY) WITH LOTS OF SHIP VIBRATIONS	1331:50	4-797	72	
	36	01	3 kts	RAM AT HIGH S. RATE (GAUGES ALSO)	1347			
				BACKING AND RAMMING				
				LONG RAM - ROCKY RIDE	1353	4-801	18	
			3 kts	RAM	1353			
				-MAKING OWN WAY SINCE LOUIS TRACK TO HARD TO FOLLOW (TOO MANY SHARP TURNS)				
			2-4 kts	CONT. TRANSIT	1403			
				RAM	1409			
				MILLING	1409:20			
			4 kts	RAM	1411			
				STOPPED TIME (EOT)	1412			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
				= 1400 channels/second				
Nov.12/81	37	00	2 kts	HIGH S. RATE ON ACC. & THRUST & TORQUE				
			4 kts	MILLING IN LOUIS TRACK	1419:20			
			2 kts	HAVING NO DIFFICULTY MILLING	1421:40			
				FOLLOWING LOUIS TRACK NOW MILLING	1424:10			
			4 kts	" " " " MILLING	1455	4-835		18
				MILLING	1456:20			
				BACKING	1502			
				RAM	1507:20			
				EOT	1510			
Nov.12/81	38	00		BACKING & RAMMING IN MYR & 1ST AND 2ND PACK ICE	1511			
				REMOVED CH 94 (UNABLE TO BAL.)	1550			
				SAMPLING S.G.F. HIGH & ACC. ONLY	1622:30) MYR 1624:50) SHIP 1630:45) BENDING!			
				WAITING FOR LOUIS TO BREAK UP MYR STOP	1643	VIDEO TAPE #5 000		18
	39	00		BACKING & RAMMING WHILE WAITING FOR LOUIS	1725:50	061		18
				PORT YAW, HEAVE & SHIP BENDING	1736:25			
				AFTER MYR IMPACT ICE MILLING	1738			
				- KEEP FALLING INTO SAME SLOT THEREFORE WAIT FOR LOUS				
				ICE MILLING	1849:50			
				STBD MYR IMPACT	1856			
			2-6 kts	CONTINUOUS TRANSIT - BENDING @ 5kts	1930:15			
				STARTING UP AGAIN AFTER SHORT WAIT TO LET LOUIS GET AHEAD	1945			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.12/81	39	01* 00*	1 - 2 kts	SEVERAL MILES BEHIND LOUIS - SAMPLING S.G. AT HIGH RATE ONLY	1947:30	5-223	18	
			4.5 kts	CONTINUOUS IN LOUIS TRACK	1955			
				EOT	1956:36			
	40	00	5 kts	LOUIS TRACK - HIGH RATE ON S.G. FILTERS LARGE MYR (ICE MILLING IN TRACK - BACKING AND RAMMING(BROKEN TRACK FOR 20 MIN.	2000:30 2022:30 2024:00 2050	5-232	18	
			5 kts	DIFFICULTY FINDING LOUIS TRACK STOP EOT	2102 2114	5-285	18	
Nov.12/81	41	00	4 kts	START TAPE HEAVY ICE SAMPLING S.G. ALL PEAK MILLING SAMPLING ACC. FILTERS ALL AT 50 Hz TO LOOK FOR RAMMING RESONANCES	2120:18 2121:50	5-307	18	
				SHIP BENDING DURING RAMS	2226 2229 2307:45			
				EOT	2312			
	42	00	0-2 kts	AS IN 41, BACKING & RAMMING	2318	5-403 5-405		
				BACKING AND RAMMING RAM RAM RAM & MILLING RAM & MILLING RAM	2334:40 2348 0008 0010 0018 0030 0102			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.13/81	42B	00		BACKING & RAMMING FOR 3 hrs EOT	0124	S-498		
NOV.13/81	43	00	0-3 kts	BACKING & RAMMING, ALL GAUGES BAL. IN BOX 3 & 4 - GAUGES CHECKED IN BOX 2 SAMPLING ACC @ 10 Hz, ALL S.G.@ PEAK - BACKING & RAMMING IN FRONT OF LARGE ICE BERG, UNABLE TO PUSH SLUDGE AWAY ON PORT & STBD	1333		18	
		01	0-3 kts	LOWEST SAMPLING RATE - ACC.@ 1Hz "REAL" FILTERS. - BACKING & RAMMING IN TRACK WAITING FOR LOUIS - MILLING	1436:10		18	
		02	5 kts	UNDER WAY AGAIN FOLLOWING LOUIS TRACK STBD IMPACT MYR FLOE EOT	1545:10 1603:50 1637			
	44	00	5kts	BACKING & RAMMING LOOSE PACK IN TRACK (7/10 1st yr) (1/10 2nd) to MYR 2 ft 4 ft 20 BERGS IN SIGHT PRIMARILY OFF STBD. IN MOUTH OF NAVY BOARD INLET	1624			
		01		CONTINUOUS TRANSIT IN 1ST YR RIDGED ICE IN LOUIS TRACK WITH ODD EXCURSION IN HAIRPIN TURNS 10/10 COV., 9.5/10 1st yr, .5/10 2nd SOME GROUNDED GROWLERS	1742			
Nov.14/81		00*	13 kts	OPEN WATER IN POND INLET	1800	S-705 S-709 S-710	72 18 72	

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.14/81	44	00		TEST FILE				
		01	5 kts	ENTERING 9/10 1st YR ICE 10/10 COV, RIDGING AND ODD				
			1 kt	2nd YR & MYR PIECE (1/10)		5-725	72	
				STUCK IN ICE: MYR FLOE AHEAD AND MYR CHUNCKS ASTERN RESULTING IN NO BACKING DISTANCE				
				BACKING AND RAMMING	2043 2050 2054			
				BACKING INTO MYR	2055			
				RAM MYR, REALLY GOOD RAM	2058 2103 2116 2120 2213			
		02		CRASH				
		00		RE-START WITH S.G. HS RATE 1st YR 2ft, PACK AT 9/10 MYR 1/10	2219:10	5-739	72	
			3-4 kts	EOT	2227			
	45	00		AS IN 44 00*(continued on MACH#0) STOP FOR NIGHT	2228 2256	5-744		
Nov.15/81	46	00		STARTING UP, LOW SAMPLING RATE BUBBLER OFF LOST 2 GAUGES (BAL.) 116,118	1013 1130	VIDEO TAPE #6 6-000	72	
			4 kts	4 KTS IN LOUIS TRACK EOT	1322 1430	6-082	72	
	47	00	10 kts	FOLLOWING LOUIS TRACK, LOW S. RATE 9/10 1st yr ICE, SOME RIDGING, 1/10 ~~MYR & 2ND YR SHOWING WITH LESS THAN 1 MILE~~ BUBBLER OFF	1513 VISIBILITY	6-100	18	

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO TAPE & COUNT	VIDEO MODE	
Nov.15/81	47	00	5.7 kts	SHIP BENDING	1550		18	
				MYR IMPACT, PUSHING FLOE	1553			
				MYR IMPACT, SHIP BENDING	1604:50			
				EOT	1607			
		01	6 kts	INCREASED S. RATE ON MID-SHIP GAUGES FOR OPEN SEAS COMPARISON BUBBLER STILL OFF	1607:52	6-153	18	
			7 kts	PASSING LARGE BERG OFF PORT	1624			
				SHIP BENDING IN 1ST YR WITH MYR IMPACT	1627	6-175	72	
				EOT	1630			
		02	8 kts	FOLLOWING LEAD IN 1ST YR RIDGED ICE - LOW SAMPLING RATE AFTER HALT IN OPEN WATER	1641			
				EOT	1651			
		03	11 kts	SUSPECT ICE				
		04	6 - 10 kts	RIDGED ICE, 2nd YR ICE IN 9/10 1st YR				
				OPEN WATER	1707	6-184		
				EOT LOST GAUGE BAL. CH.70				
	48	00	00	BACKING & RAMMING MYR WITH LOUIS TRACK - BAD GAUGES REBALANCED & FILTER CONF. CHANGED	2004	6-230	72	
				MYR & 2ND YR IMPACTS STBD SHOULDER	2014			
				STBD FWD	2019			
				" "	2029			
				" "	2045			
				EOT	2055			

TABLE C

DATE	TAPE	FILE	SHIP SPEED	ICE & EVENT	TIME(GMT)	VIDEO		
						TAPE & COUNT	MODE	
Nov.15/81	48	01	4.5 kts	IN LOUIS TRACK - LOW SAMPLING RATE	2138	6-252	72	
				STARBOARD IMPACT MYR	2150			
				BACKING & RAMMING	2155			
				RAM	2222			
				RAM	2226			
				RAM	2232			
				EOT	2232			
	49	00						
		01	5 kts	LOWEST S. RATE POSS. IN LOUIS TRACK - 1st yr ICE 8/10 coverage 6-8" THICK - NO MYR	2317			
				EOT	0205 NOV.16/81	6-375	72	

APPENDIX D

DISCUSSION OF COMPARISON OF RESULTS FOR ANALOG AND DIGITAL RECORDINGS

DISCUSSION OF COMPARISON OF RESULTS FOR ANALOG AND DIGITAL RECORDINGS

During the discrete impact analysis the opportunity arose to compare the computer records with the analog recorder records. Table summarizes three cases where computer maximums do not agree 100% with the analog records.

Channel 108 on the computer consistently remained close to zero for these cases despite the analog record showing activity up to maximum of 600μS. Further investigation revealed that channel 108 in statistical analysis has not yet registered a strain over 100μS. The conclusion is that the peak circuit of channel 108 was defective. On the other hand, the analog recorder at no time registered a significant strain for channel 124 where as the computer records clearly shows activity on this channel. The recorder was most likely at fault, probably with a bad connection on amplifier card 124. As a result only 7 of the 8 recorder channels were used in the preliminary analysis.

The recorders environment was not hospitable in the forecastle where it experienced large temperature variations during warm up as well as heavy vibration. As a result the analog records show a voltage fluctuation common to all channels caused by poor speed regulation, most likely from cold bearings. To minimize this interference during analysis, all signals were filtered at 16 Hz. As seen from Figure D.1, this did not remove the problem completely and added an uncertainty in the measurement of strain levels and rise times estimated at 5%. The temperature variations also added uncertainty in the recorder's amplifier calibrations. If one optimistically sets this error at 5% then one is up to 10% uncertainty in the recorders measurement of strain.

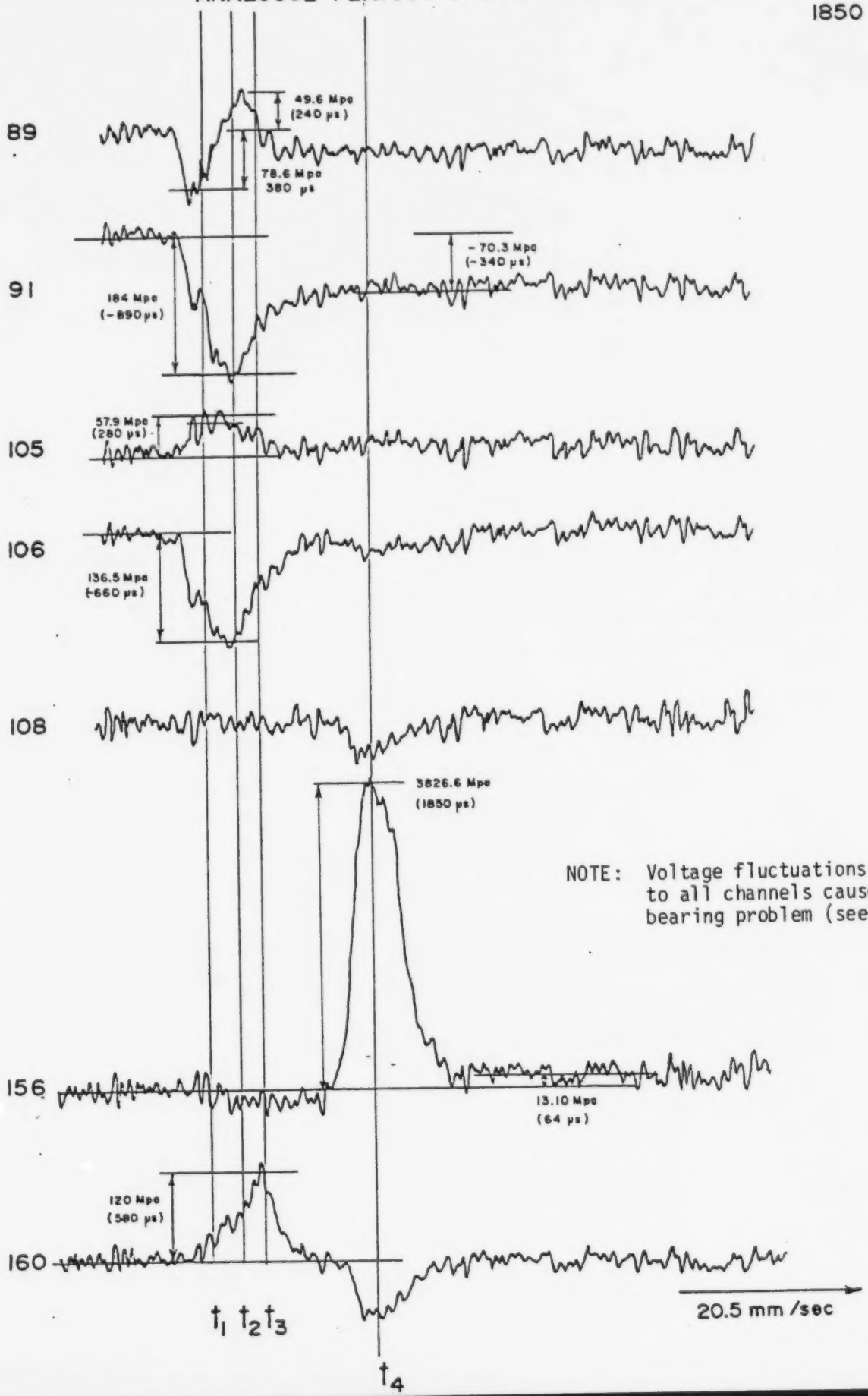
The accuracy of the computers strain measurement was not assessed while on the ship. Due to the number of amplifiers and drivers that the signal sees on its path to the A/D converter it is reasonable to assume that the computer measurement accuracy is in the order of 5%.

From the above discussions it is conceivable that computer and analog recorder measurements could disagree by as much as 15%. Plotting analog values versus computer values from tables 3.3 and 3.4 results in a correlation of 0.990 as seen by Figure D.2 and Table D.1. The regression co-efficients reveal an offset error of 73μS and a slope error of 9.2 percent. The FM recorder zero level is set by looking at the signal just before the strain peak, taking this level as the zero and making all peak measurements from this line. The computers zero level is made from the assumptions that the signal spends 99% of the time at zero making the average signal level the zero level. The assumption is that intermittent peak strains do not have sufficient duration to significantly alter the average signal level.

FIG. D.1

ANALOGUE PLAYOUT OF 2ND IMPACT

NOV. 6
1850 HRS.



NOTE: Voltage fluctuations common to all channels caused by bearing problem (see text).

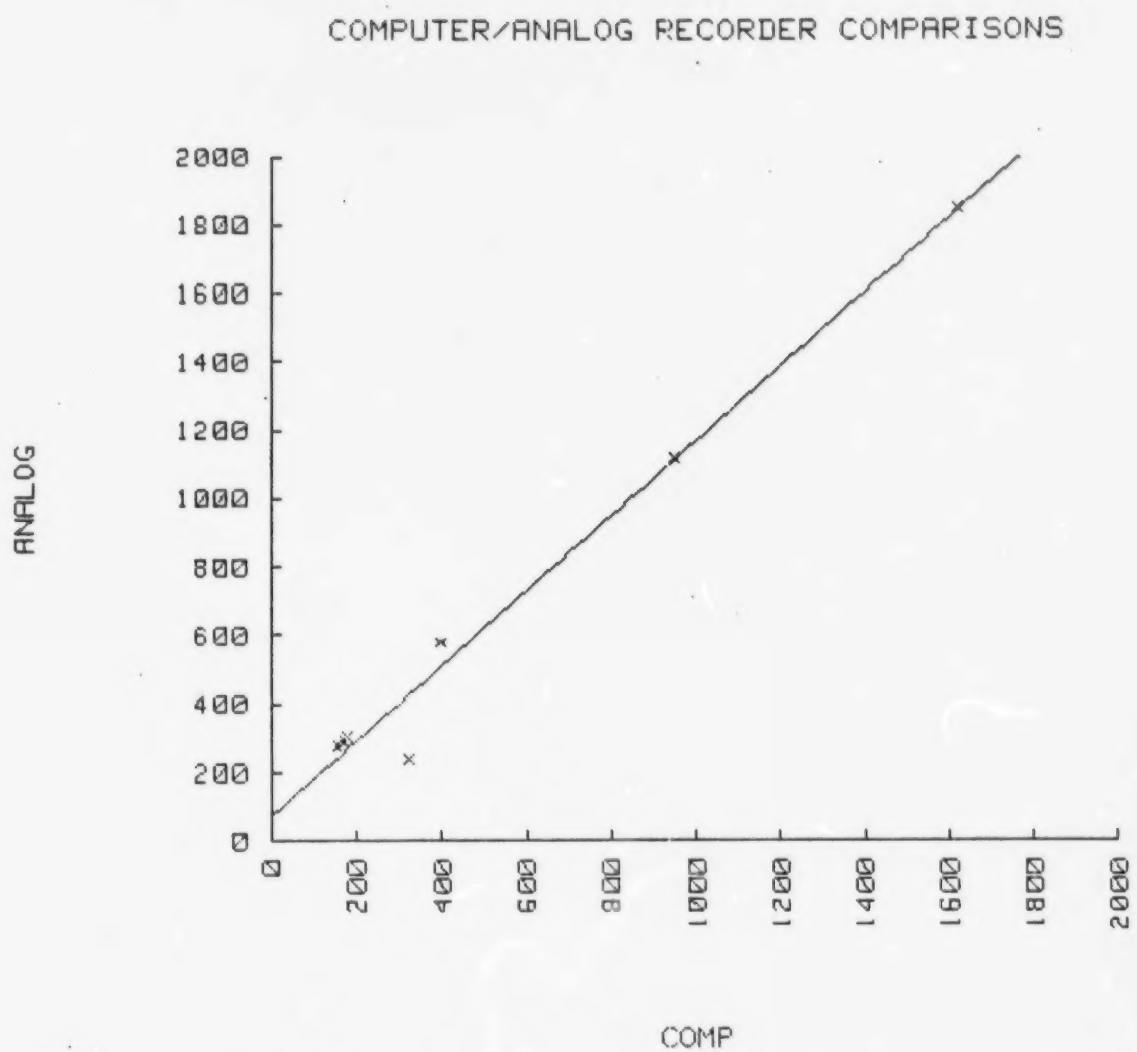

COMPUTER/ANALOG RECORDER COMPARISONS
ANALOG
2000
1800
1600
1400
1200
1000
800
600
400
200
0
0
200
400
600
800
1000
1200
1400
1600
1800
2000
COMP

FIGURE D.2

TABLE D.1

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
COMP	7	543.14286	303706.80952	551.09601	101.46428
ANALOG	7	666.42857	369589.28572	607.93855	91.22336

CORRELATION = .990007691626

Selected degree of regression = 1
R-SQUARED = .980115229452
STANDARD ERROR OF ESTIMATE = 93.9097320409

AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	6	2217535.71429		
REGRESSION	1	2173440.52543	2173440.52543	246.45
X^1	1	2173440.52542	2173440.52542	246.45
RESIDUAL	5	44095.18886	8819.03777	

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	73.25053	.732505339330E+02	51.84192	1.41
X^1	1.09212	.109212158403E+01	.06957	15.70

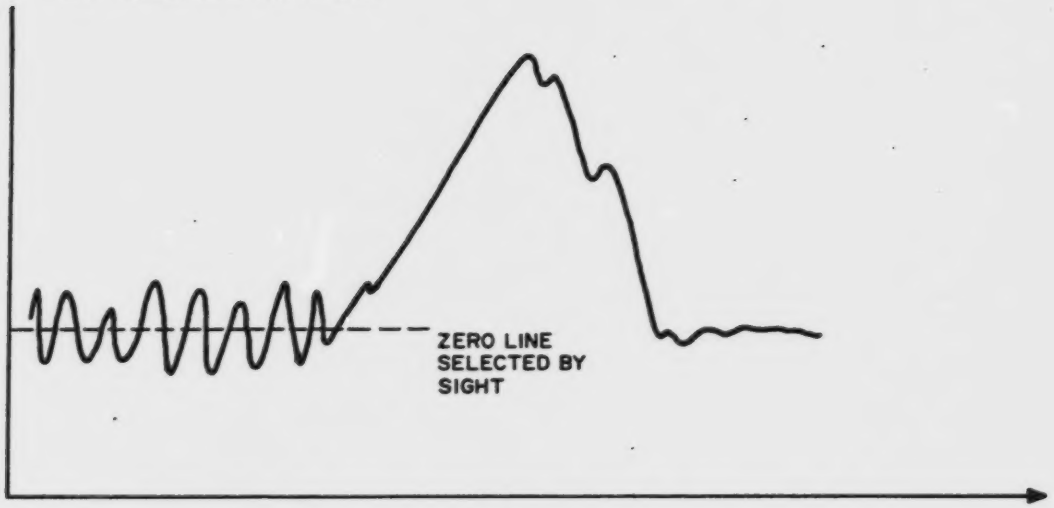
	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	73.25053	-31.23955	177.74062
X^1	1.09212	.95190	1.23234

One explanation for this zero level inconsistency between computer and recorder could be found in the case of high noise levels. Figure D.3 illustrates the effect of high noise levels on the average value of a peak detector. Note that to have a 73μS zero shift the peak-to-peak noise level would have to be 146μS or approximately 370 mV or 130 mV RMS.

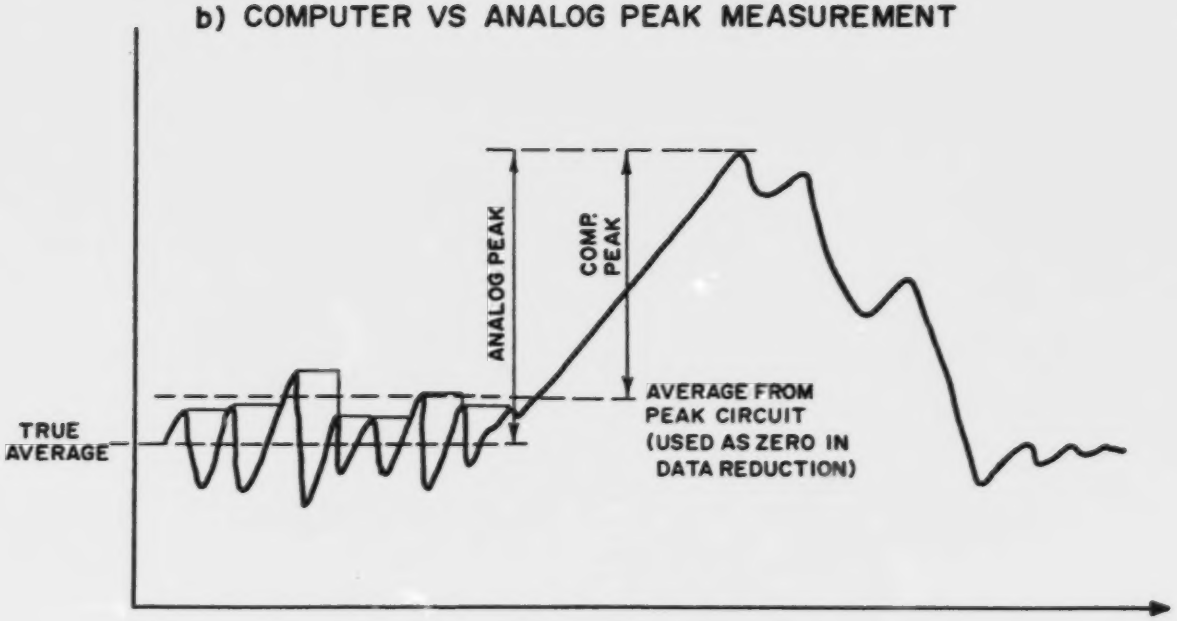
The analog recorder does not show a 130mV RMS noise level however, the records are distorted from the environmental problems described earlier. With spectrum analysis of the analog records it may be possible to separate signal noise from mechanical speed fluctuations however, this course was considered beyond the scope of this study. In future work with this system the analog tests points should be compared with the peak test points (while being scanned) to assess the signals noise level.

FIGURE D.3

a) ANALOG RECORD



b) COMPUTER VS ANALOG PEAK MEASUREMENT



NOTE THAT THE ANALOG PEAK WOULD APPEAR LARGER THAN THE COMPUTER PEAK.

APPENDIX E

REGRESSION ANALYSIS OF STATISTICAL DATA

E.1 INTRODUCTION

E.2 CONTINUOUS TRANSIT: Good Correlations

E.3 CONTINUOUS TRANSIT: Poor Correlations

E.4 BACKING & RAMMING: Good Correlations

E.5 BACKING & RAMMING: Poor Correlations

E.1 INTRODUCTION

In 4.3 of the report the analysis of statistical data is explained in detail. This appendix contains all the regressions discussed in 4.3. In addition, a number of the tables from 4.3 are reproduced here for the sake of convenience.

TABLE E.1

FR > 100 μS:	The number of frame gauge reading greater than 100 μS during the statistical collection period.
FR SUM:	The sum of the frame strain maximums
FR AVE:	The average of the frame strain maximums
FR MAX:	The maximum frame strain
PL > 100 μS:	The number of plate gauges greater than 100 μS.
PL MAX:	The maximum plate strains
VEL MAX:	The average ship speed (knots)
T AVE:	The average thrust in metric tonnes
VEL MAX:	The maximum ship speed

TABLE E.2

RESULTS OF STATISTICAL ANALYSIS FOR SELECTED CASES

TAPE OBSERVATION NO / TAPE NO.	CT#1 16-C	BR#1 19E-1	CT#2 20-A	CT#3 20-B	BR#2 22-A	BR#3/CT#4 26-A	BR#4 26-B	CT#5 27-B	CT#6 28-A	CT#7 28-B	CT#8 32-A	BR#5 36-A	BR#6 36-B	BR#7 38-B
NO. OF FRAME GAUGES OVER 100 μS (FR > 100 μS)	5	11	31	30	25	29	16	38	40	38	10	41	34	27
SUM OF FRAME GAUGES OVER 100μS (FR SUM)	3040	2465	11580	5730	7422	11500	3110	11420	17000	10165	8214	21339	12575	10883
FRAME AVERAGE (B/A) (FR AVE)	608	224	373.5	191	296	396	194	293	425	267.5	821.4	520	369	403
MAXIMUM FRAME STRAIN (FR MAX)	2000	300	1300	860	790	1140	380	670	1665	950	1762	1400	1240	1014
NO. OF PLATE GAUGES OVER 100μS (PL > 100μS)	5	6	19	17	14	15	6	20	19	20	11	26	15	15
MAXIMUM PLATE STRAIN (PL MAX)	270	300	800	620	800	915	350	850	1200	950	1856	1750	1400	1804
MAXIMUM SHIP SPEED (KNOTS)	4.0	16.32	12.72	6.3	3.40	6.09	6.91	29.77	16.73	6.21	7.62	11.69	4	2.90
MINIMUM SHIP SPEED (KNOTS)	1.5	1.38	0.70	0	0.39	0	0	0.09	0.88	1.44	4.22	0	0.03	0
AVERAGE SHIP SPEED (KNOTS)	1.0	6.5	6.82	3	1.57	2	2.2	8	6.6	4.6	5.88	1.28	2.2	0.79
AVERAGE THRUST (TONNES)	1.83	81.96	69.40	32	70.31	55	52	38	44	41.69	35.8	77	82	83.9
DURATION OF STATISTICAL OBSERVATION (MINS)	23	3	17	53	26	110	70	77	48	7	7	101	24	46

TABLE E.3

CASE DESCRIPTIONS

OBSERVATION	TAPE I.D.	DESCRIPTION
BACKING & RAMMING		
BR#1	19-E	In 3/10 MY, 8/10 1st year
BR#2	22-A	1-4 knots (3 knots average)
BR#3	26-A	1-3 knots, 8/10 1st yr, 2/10 MY
BR#4	26-B*	(10 min) plus 5 knots continuous in 1st year.
BR#5	36-A	In LOUIS track, 1st year & 2/10 MY
BR#6	36-B	Heavy going in pack ice
BR#7	38-B	1st year and MY pack ice
CONTINUOUS TRANSIT		
CT#1	16-C	6/10 1st yr, 3/10 MY cont. transit
CT#2	20-A	8-10 knots 1st yr/ 1-4 knts Loose Pack (1/10 MY)
CT#3	20-B	2-5 knots 9/10 1st yr with leads/ Rams in MY rub.
CT#4	26-B*	Backing & ramming (10 min)/5 knots continuous in 1st year
CT#5	27-B	1st yr, 1/10 MY, 8/10 coverage continuous transit, 8 knots
CT#6	28-A	1st & 2nd yr ridged ice 3- 10 knots continuous transit
CT#7	28-B	7 knots 8/10 coverage 1st & 2nd yr loose pack
CT#8	32-A	4 knots continuous transit.

*Used in both backing and ramming and continuous transit cases.

TABLE E.4

CHART SUMMARY OF STATISTICAL ANALYSIS

	#FR > 100 μS # FRAME GAUGES 100 μS	FR SUM [μS] SUM OF FRAME GAUGES > 100 μS	FR AVE [μS] AVE. FRAME STRAIN	FR MAX [μS] MAX. FRAME STRAIN	# PL > 100 μS # PLATE GAUGES 100 μS	PL MAX [μS] MAX. PLATE STRAIN	VEL AVE[kt] AVE. SHIP SPEED	T AVE [MT] AVE. THRUST [TONNES]	VEL MAX [kt] MAX. SHIP SPEED
#FR > 100 μS					BR(*)/CT(*)		BR(♦)/CT(*)		
FR SUM [μS]					BR(*)/CT(*)		BR(♦)/CT(*)		
FR AVE [μS]					BR(*)/CT(♦)	CT(*)	BR(♦)/CT(?)		BR(♦)
FR MAX [μS]					/CT(♦)		BR(♦)/CT(?)		BR(♦)
#PL > 100 μS						BR(*)/CT(*)	BR(♦)/CT(*)		BR(♦)
PL MAX [μS]							BR(♦)		BR(♦)
VEL AVE [kt]								BR(♦)/CT	

KEY: (*): CORRELATION

( ): NO CORRELATION

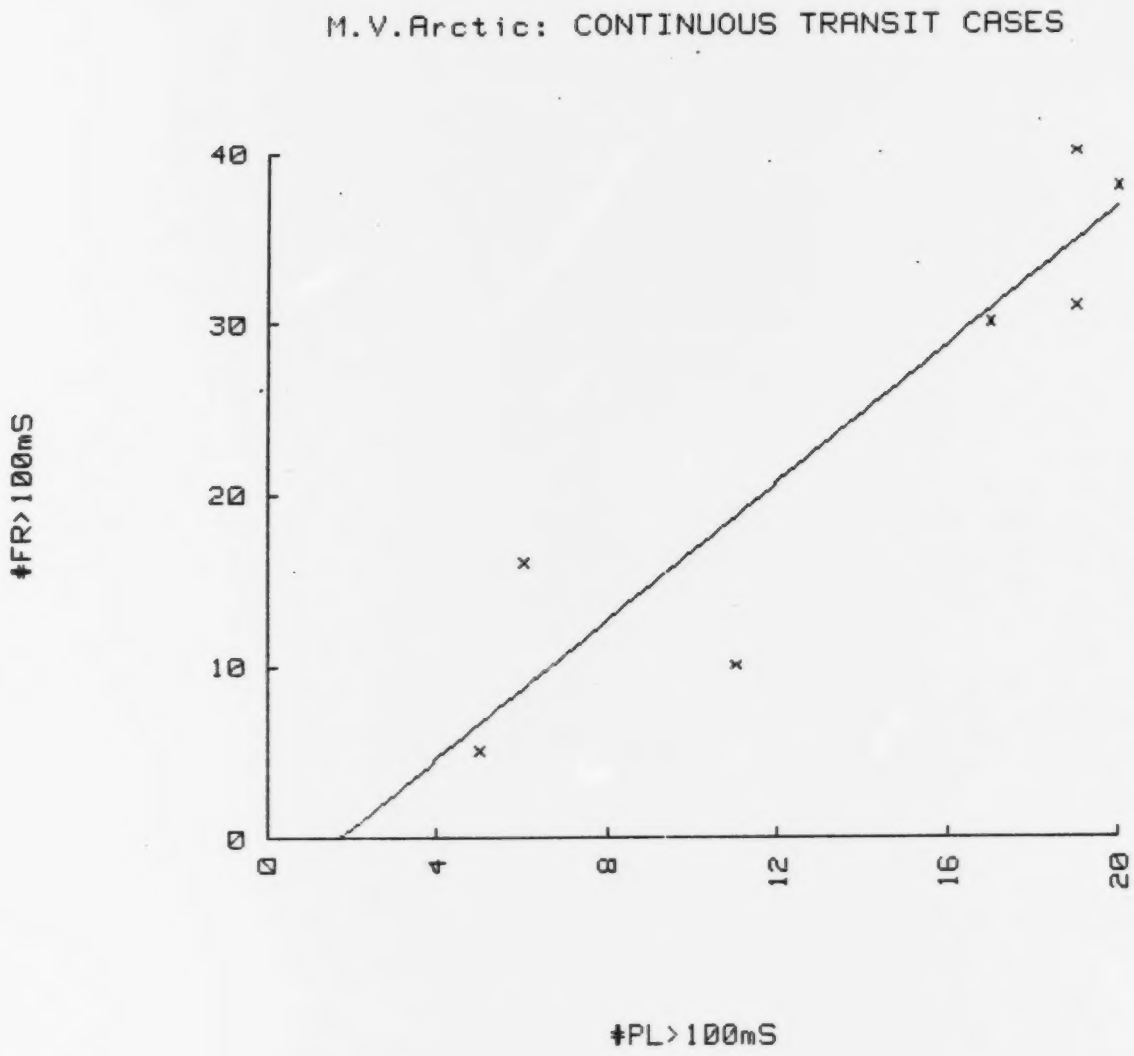
(?): SOME BAD POINTS DESTROY CORRELATION

(BLANK): ANALYSIS NOT PERFORMED

BR( ): BACKING & RAMMING CASE

CT( ): CONTINUOUS TRANSIT CASE

E.2 Continuous Transit: Good Correlations


M.V.Arctic: CONTINUOUS TRANSIT CASES
#FR>100mS
#PL>100mS
0
10
20
30
40
0
4
8
12
16
20

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
#PL>100mS	8	14.62500	40.26786	6.34570	43.38937
#FR>100mS	8	26.00000	188.85714	13.74253	52.85589

CORRELATION = .930474184834

Selected degree of regression = 1
R-SQUARED = .865782208707
STANDARD ERROR OF ESTIMATE = 5.43807441547

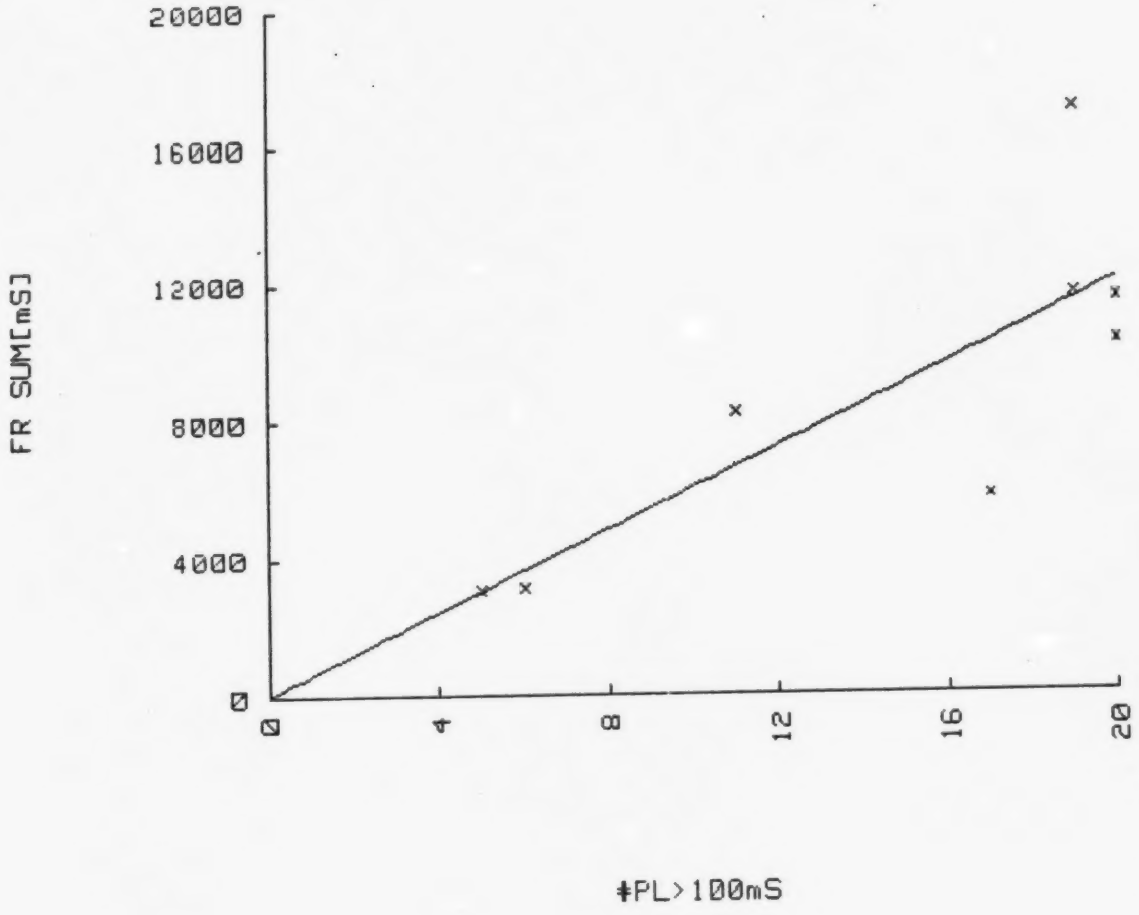
AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	7	1322.00000		
REGRESSION	1	1144.56408	1144.56408	38.70
X^1	1	1144.56408	1144.56408	38.70
RESIDUAL	6	177.43592	29.57265	

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	-3.47051	-.347050997970E+01	5.11241	-.68
X^1	2.01508	.201507760545E+01	.32390	6.22

	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	-3.47051	-13.40741	6.46639
X^1	2.01508	1.38551	2.64465

M.V.Arctic: CONTINUOUS TRANSIT CASES




```
*******************************************************************************
POLYNOMIAL REGRESSION ON DATA SET:
                    M.V.Arctic: CONTINUOUS TRANSIT CASES
*******************************************************************************

--where:  Dependent variable = FR AVE[mS]
          Independent variable = #PL>100mS
```

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
#PL>100mS	8	14.62500	40.26786	6.34570	43.38937
FR SUM[mS]	8	8782.37500			

22716505.125 M7D.5D
4766.18350 54.26987

CORRELATION = .79733374063

Selected degree of regression = 1
R-SQUARED = .635741093993
STANDARD ERROR OF ESTIMATE = 3107.05715901

AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	7			

159015535.875 M7D.5D

REGRESSION	1			

101092710.739 M7D.5D

101092710.739 M7D.5D
10.47

X^1	1			

101092710.739 M7D.5D

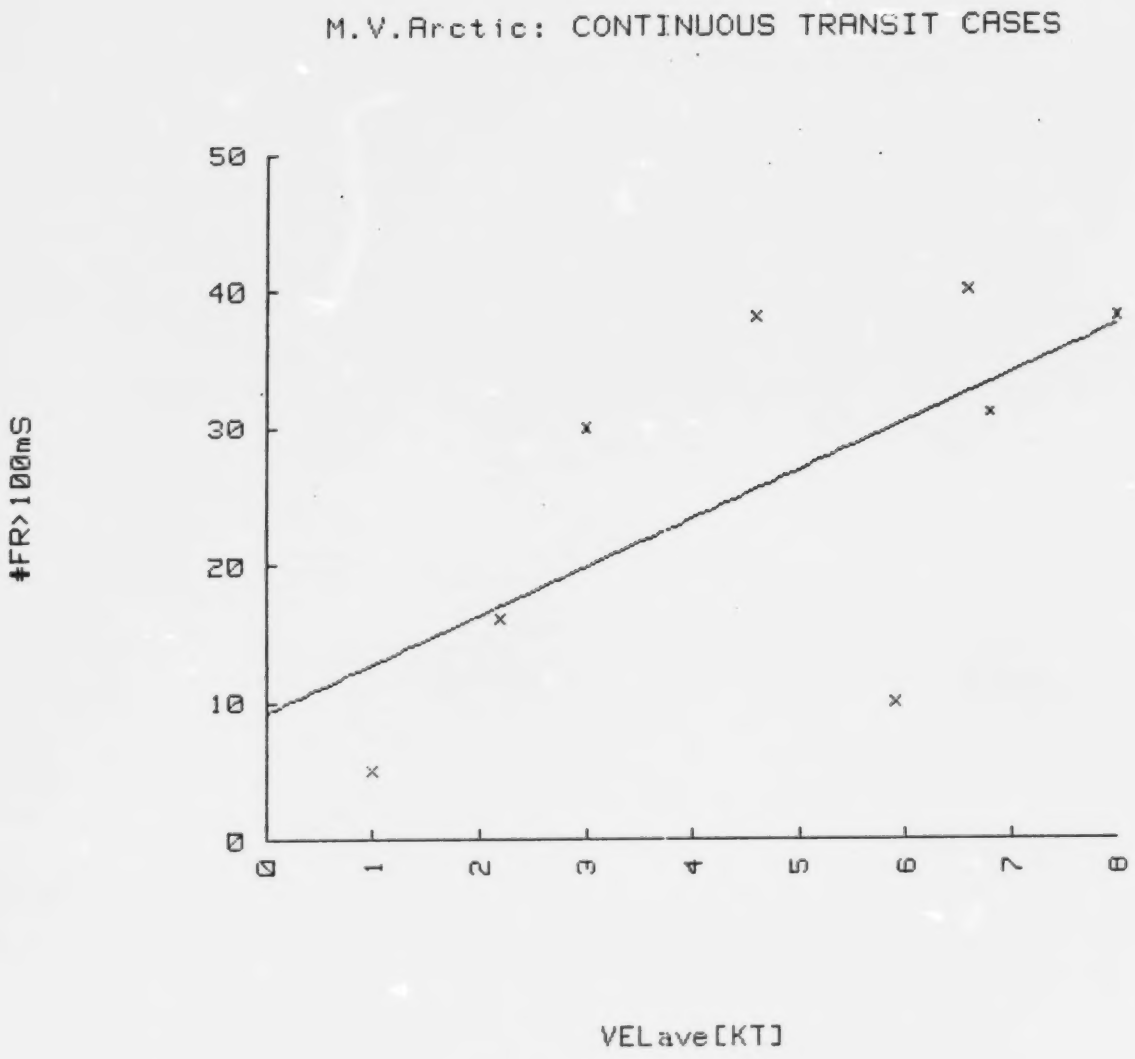
101092710.739 M7D.5D
10.47

RESIDUAL	6			

57922825.136 M7D.5D
9653804.18933

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	23.91973	.239197332200E+02	2920.98697	.01
X^1	598.86874	.598868736189E+03	185.06358	3.24

	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	23.91973	-5653.55385	5701.39331
X^1	598.86874	239.16374	958.57373



****

POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: CONTINUOUS TRANSIT CASES

****

--where: Dependent variable = FR SUM[mS]
Independent variable = VELave[KT]

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
VELave[KT]	8	4.76250	6.16554	2.48305	52.13753
#FR>100mS	8	26.00000	188.85714	13.74253	52.85589

CORRELATION = .637183463083

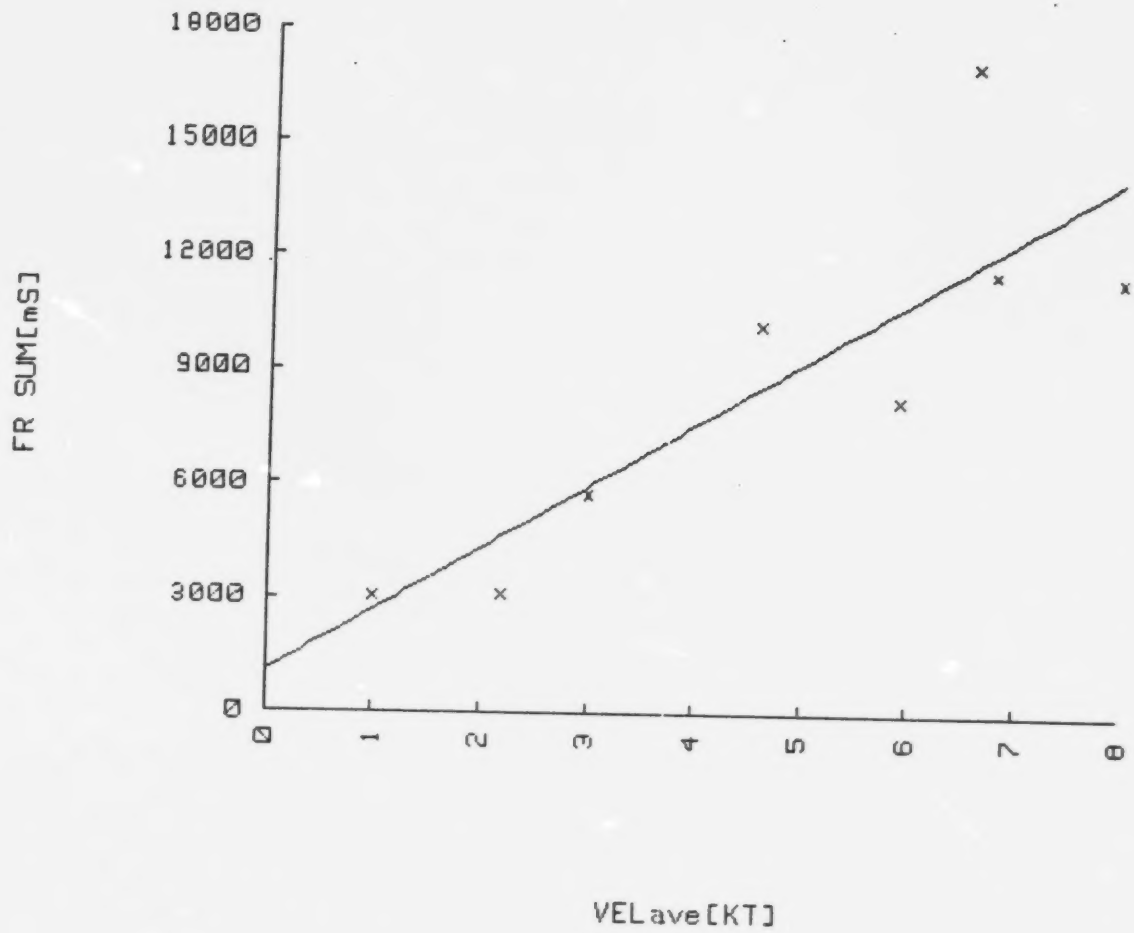
Selected degree of regression = 1
R-SQUARED = .406002765651
STANDARD ERROR OF ESTIMATE = 11.4401656736

AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	7	1322.00000		
REGRESSION	1	536.73566	536.73566	4.10
X^1	1	536.73566	536.73566	4.10
RESIDUAL	6	785.26434	130.87739	

	REGRESSION COEFFICIENTS		STANDARD ERROR	
VARIABLE	STD. FORMAT	E-FORMAT	REG. COEFFICIENT	T-VALUE
'CONSTANT'	9.20497	.920497002340E+01	9.22715	1.00
X^1	3.52652	.352651548066E+01	1.74140	2.03

		90 % CONFIDENCE INTERVAL	
	COEFFICIENT	LOWER LIMIT	UPPER LIMIT
'CONSTANT'	9.20497	-8.72968	27.13962
X^1	3.52652	.14179	6.91124



****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: CONTINUOUS TRANSIT CASES
****

--where: Dependent variable = FR AVE[mS]
Independent variable = VELave[KT]

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
VELave[KT]	8	4.76250	6.16554	2.48305	52.13753
FR SUM[mS]	8	8782.37500			

22716505.125 M7D.5D
4766.18350 54.26987

CORRELATION = .844843523175

Selected degree of regression = 1
R-SQUARED = .713760578691
STANDARD ERROR OF ESTIMATE = 2754.28499396

AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	7			

159015535.875 M7D.5D

REGRESSION	1			

113499020.907 M7D.5D

113499020.907 M7D.5D
14.96

X^1	1			

113499020.907 M7D.5D

113499020.907 M7D.5D
14.96

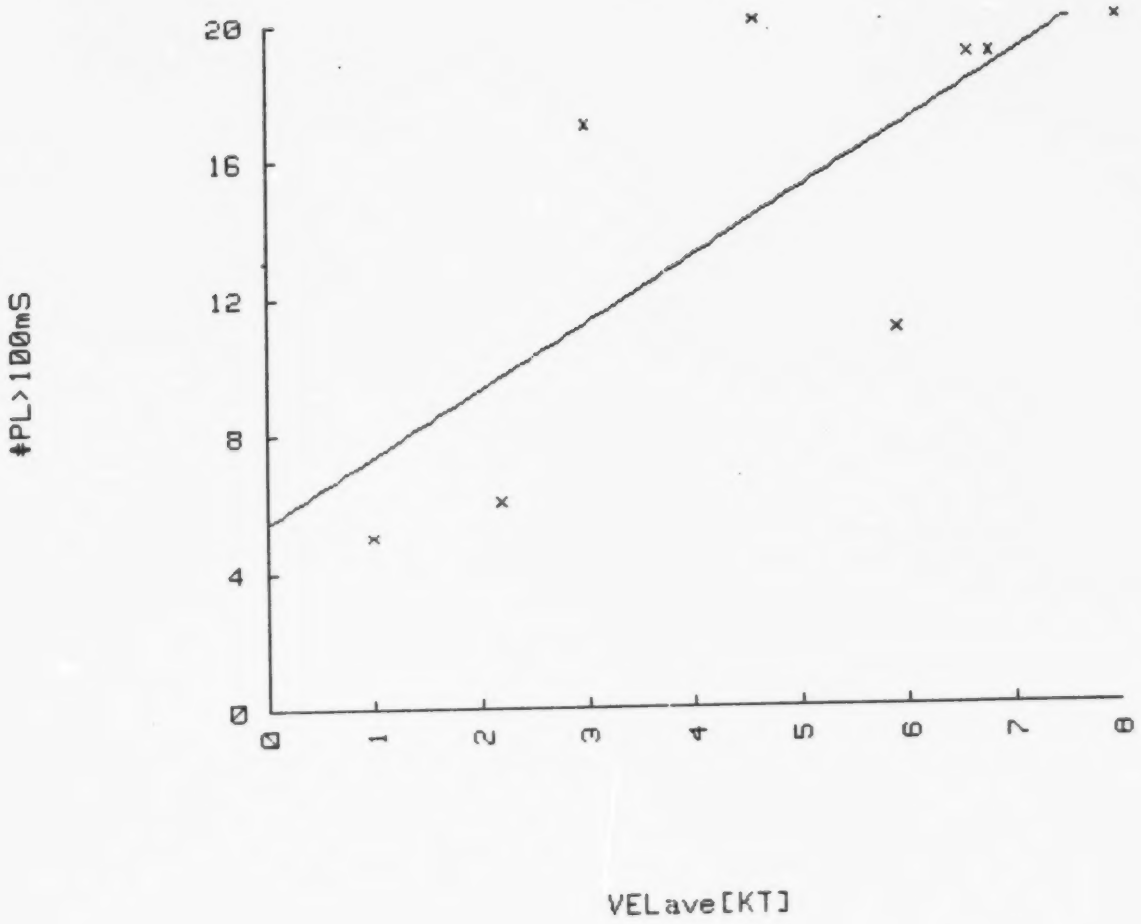
RESIDUAL	6			

45516514.968 M7D.5D
7586085.82800

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	1059.18681	.105918681030E+04	2221.48813	.48
X^1	1621.66681	.162166681149E+04	419.25133	3.87

	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	1059.18681	-3258.68257	5377.05619
X^1	1621.66681	806.77501	2436.55862

M.V.Arctic: CONTINUOUS TRANSIT CASES



VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
VELave[KT]	8	4.76250	6.16554	2.48305	52.13753
#PL>100mS	8	14.62500	40.26786	6.34570	43.38937

CORRELATION = .756935280381

Selected degree of regression = 1
R-SQUARED = .572951018721
STANDARD ERROR OF ESTIMATE = 4.47910764172

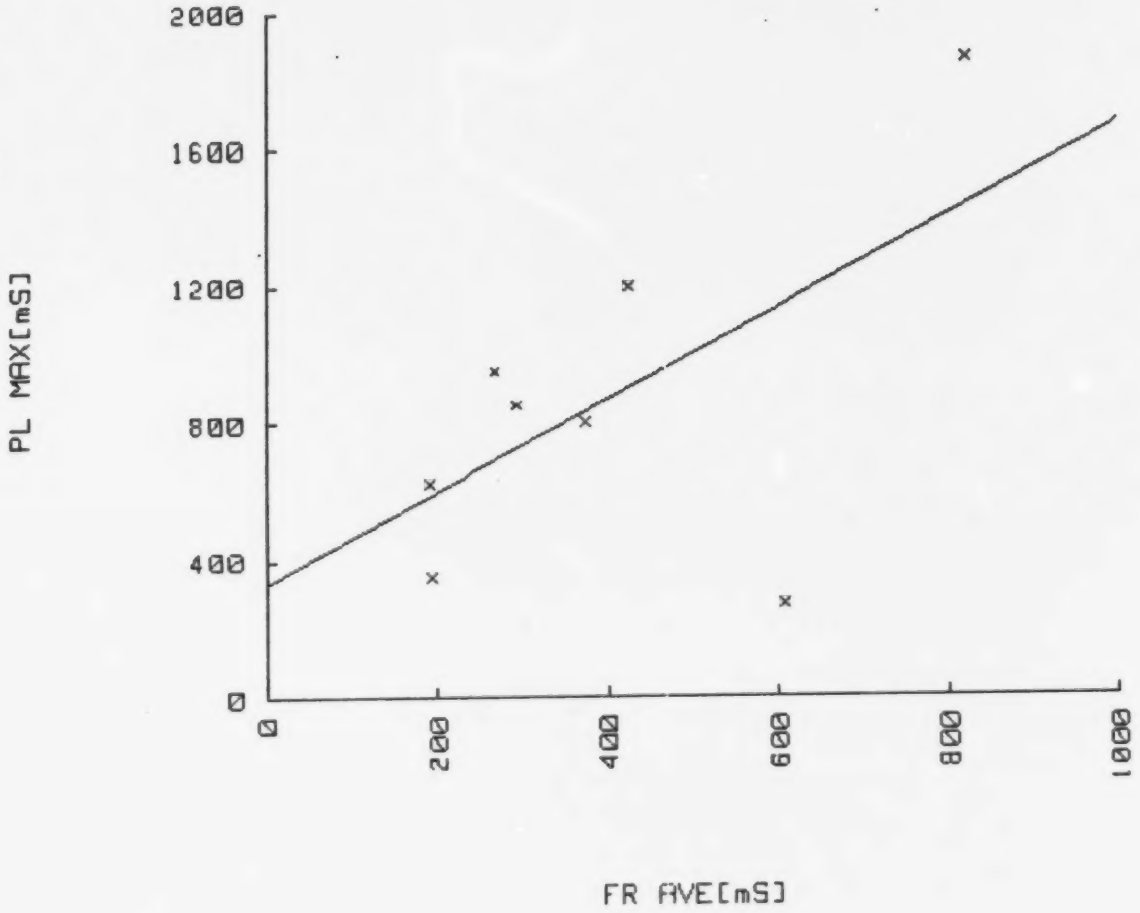
AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	7	281.87500		
REGRESSION	1	161.50057	161.50057	8.05
X^1	1	161.50057	161.50057	8.05
RESIDUAL	6	120.37443	20.06241	

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	5.41229	.541228603720E+01	3.61266	1.50
X^1	1.93443	.193442812869E+01	.68180	2.84

	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	5.41229	-1.60957	12.43415
X^1	1.93443	.60922	3.25963

M.V.Arctic: CONTINUOUS TRANSIT CASES



VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
FR AVE[mS]	8	396.67500	48171.85929	219.48089	55.33015
PL MAX[mS]	8	862.00000	255026.28571	505.00127	58.58483

CORRELATION = .581933070305

Selected degree of regression = 1
R-SQUARED = .338646098329
STANDARD ERROR OF ESTIMATE = 443.591103682

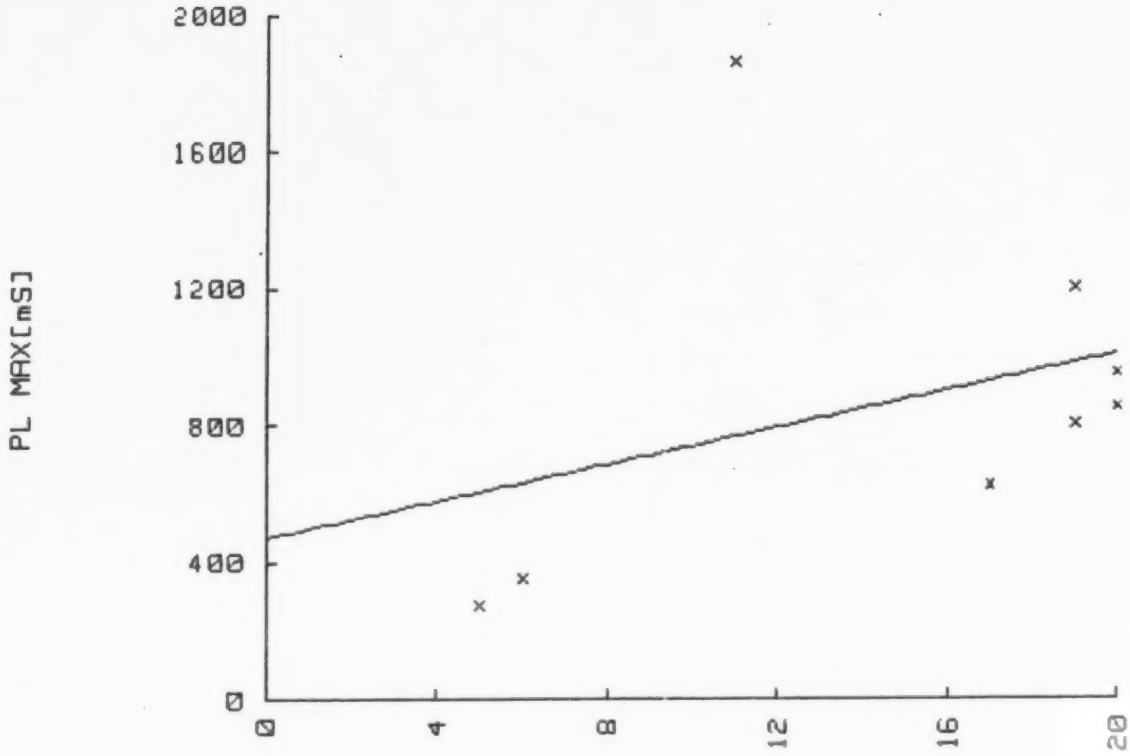
AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	7	1785184.00000		
REGRESSION	1	604545.59640	604545.59640	3.07
X^1	1	604545.59636	604545.59636	3.07
RESIDUAL	6	1180638.40360	196773.06727	

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	330.86657	.330866570335E+03	341.20086	.97
X^1	1.33896	.133896371001E+01	.76390	1.75

	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	330.86657	-332.31984	994.05298
X^1	1.33896	-.14582	2.82375

M.V.Arctic: CONTINUOUS TRANSIT CASES



VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
#PL>100mS	8	14.62500	40.26786	6.34570	43.38937
PL MAX[mS]	8	862.00000	255026.28571	505.00127	58.58483

CORRELATION = .336660534662

Selected degree of regression = 1
R-SQUARED = .113340315598
STANDARD ERROR OF ESTIMATE = 513.622864566

AOV

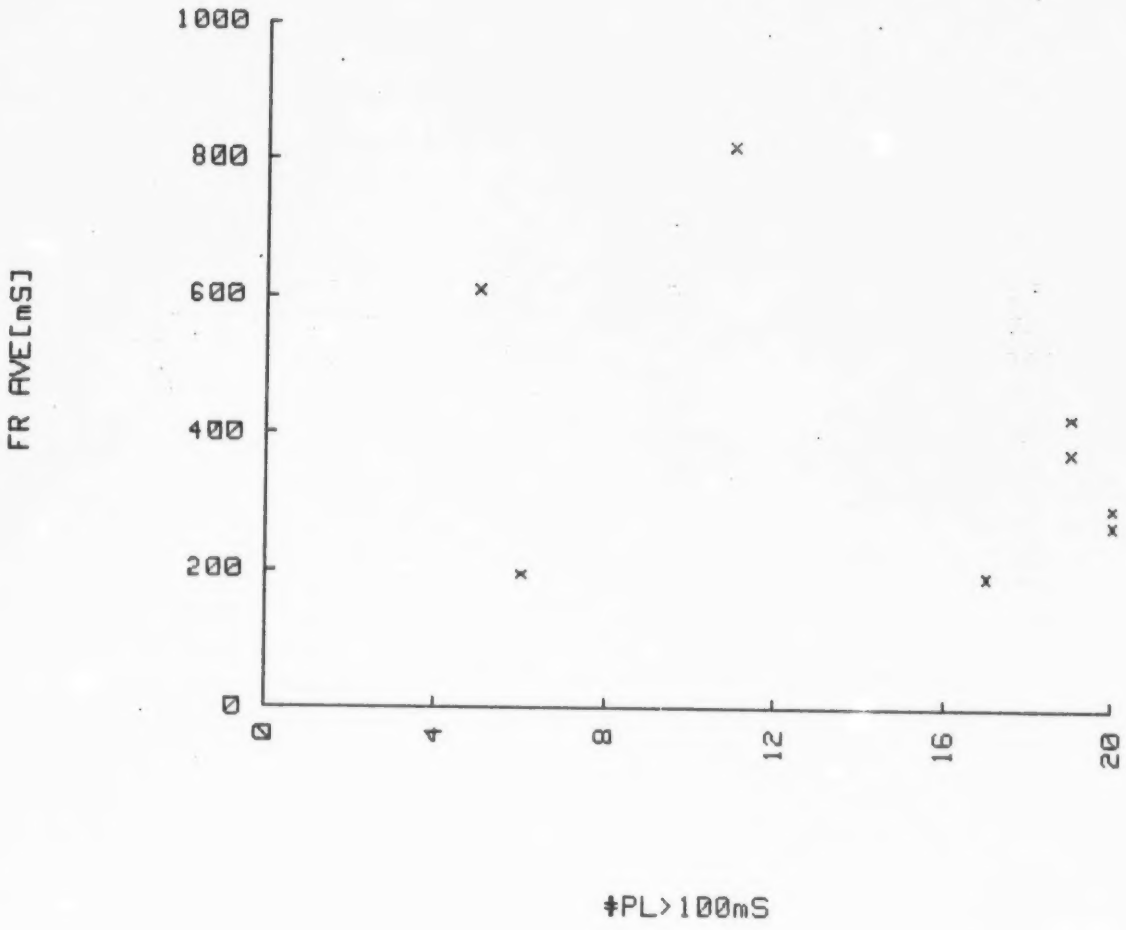
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	7	1785184.00000		
REGRESSION	1	202333.31796	202333.31796	.77
X^1	1	202333.31792	202333.31792	.77
RESIDUAL	6	1582850.68204	263808.44701	

	REGRESSION COEFFICIENTS		STANDARD ERROR	
VARIABLE	STD. FORMAT	E-FORMAT	REG. COEFFICIENT	T-VALUE
'CONSTANT'	470.16674	.470166740600E+03	482.86389	.97
X^1	26.79202	.267920177369E+02	30.59258	.88

		90 % CONFIDENCE INTERVAL	
	COEFFICIENT	LOWER LIMIT	UPPER LIMIT
'CONSTANT'	470.16674	-468.36773	1408.70121
X^1	26.79202	-32.67026	86.25430

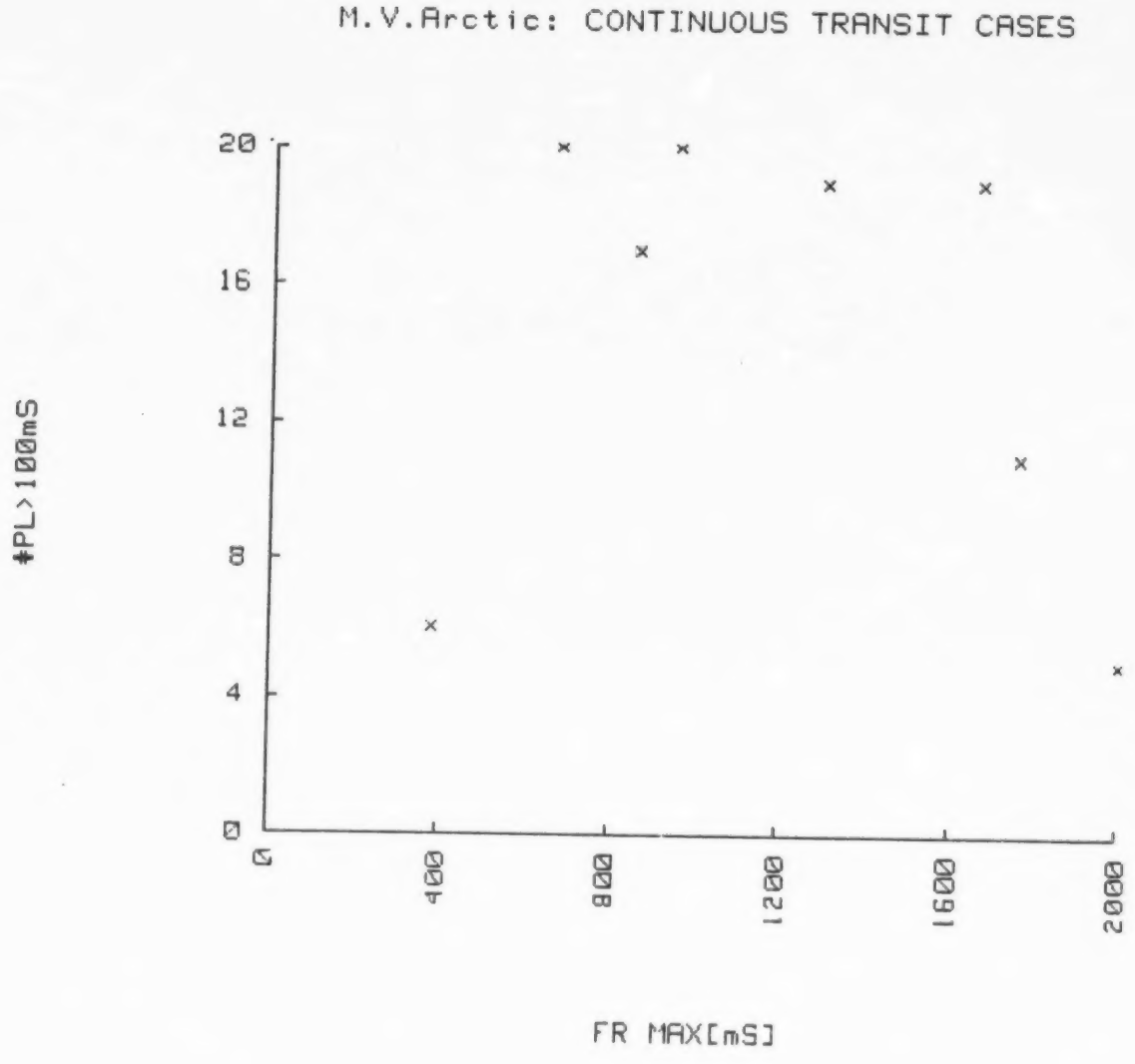
E.3 Continuous Transit: Poor Correlations

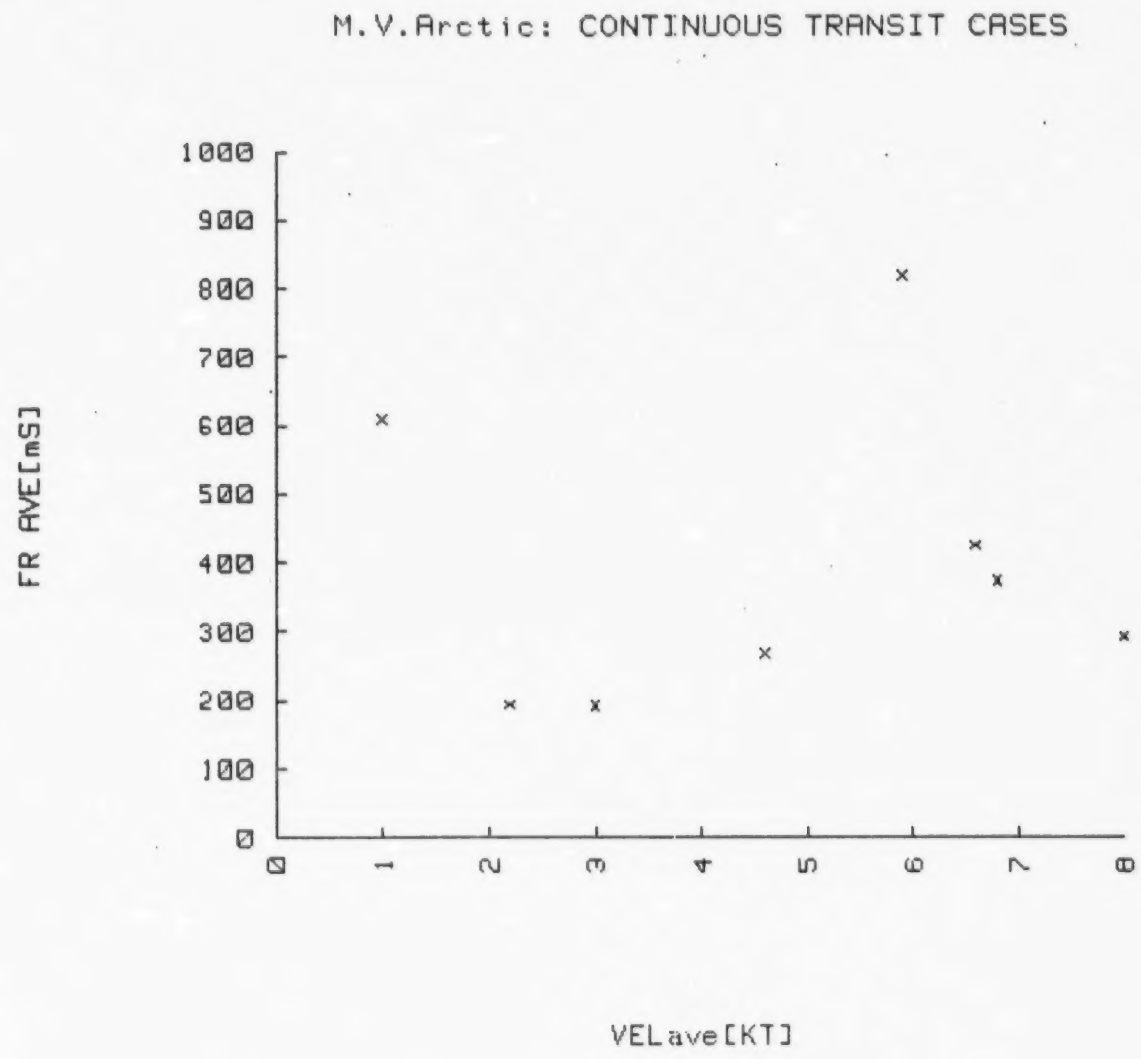
M.V.Arctic: CONTINUOUS TRANSIT CASES

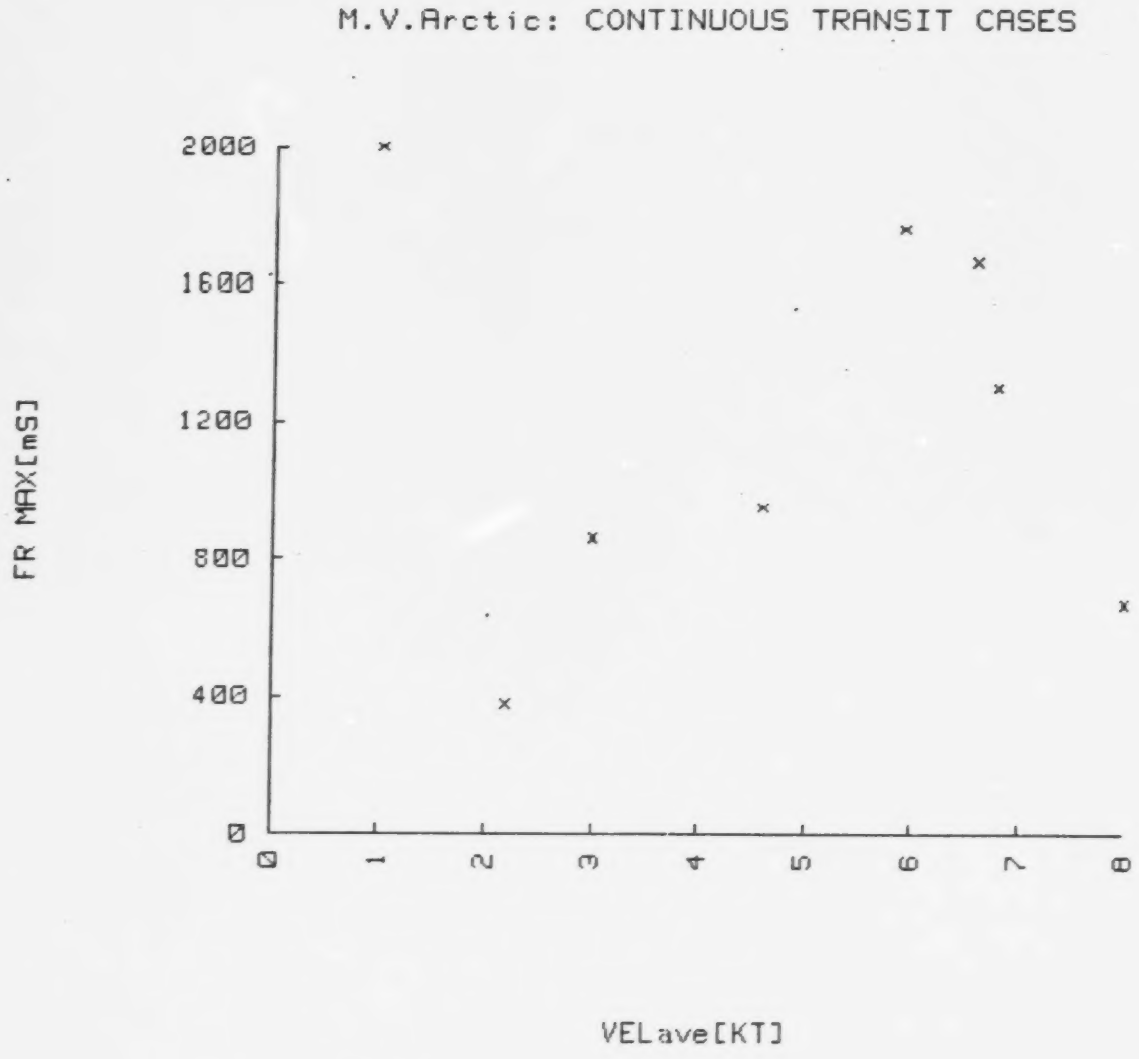


****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: CONTINUOUS TRANSIT CASES
****

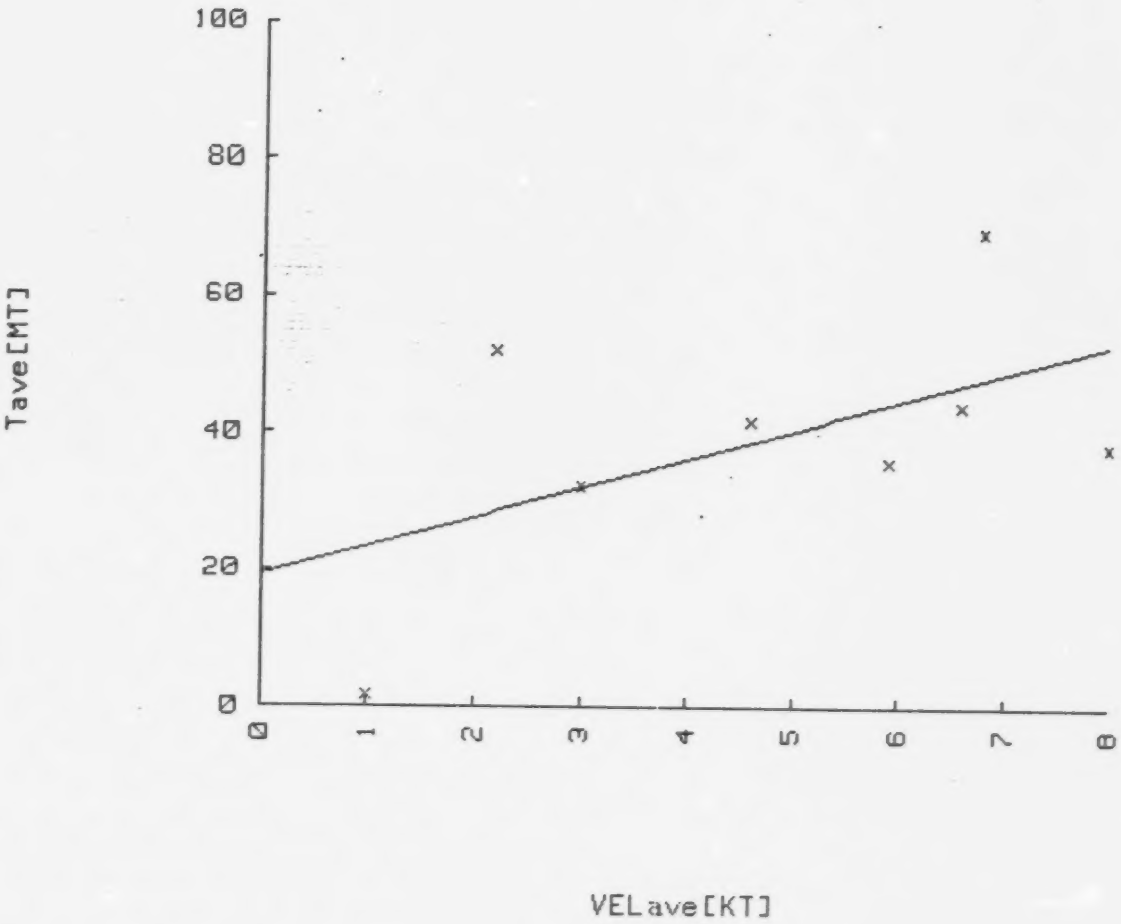
--where: Dependent variable = #PL>100mS
Independent variable = FR MAX[mS]




M.V.Arctic: CONTINUOUS TRANSIT CASES
FR AVE[mS]
1000
900
800
700
600
500
400
300
200
100
0
0
1
2
3
4
5
6
7
8
VELave[KT]


M.V.Arctic: CONTINUOUS TRANSIT CASES
FR MAX[mS]
2000
1600
1200
800
400
0
0
1
2
3
4
5
6
7
8
VELave[KT]

M.V.Arctic: CONTINUOUS TRANSIT CASES



VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
VELave[KT]	8	4.76250	6.16554	2.48305	52.13753
Tave[MT]	8	39.33750	366.94554	19.15582	48.69609

CORRELATION = .549028523781

Selected degree of regression = 1
R-SQUARED = .301432319966
STANDARD ERROR OF ESTIMATE = 17.2933226084

AOV

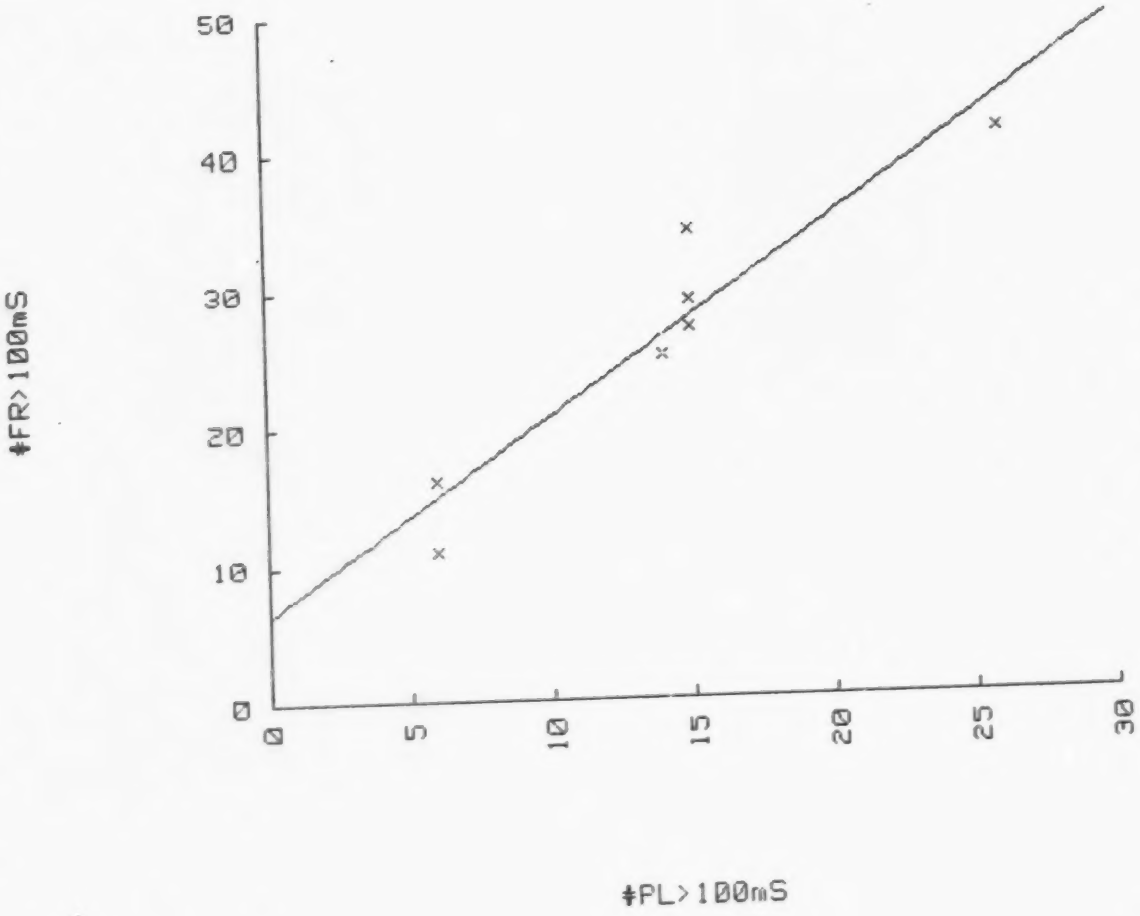
SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	7	2568.61875		
REGRESSION	1	774.26471	774.26471	2.59
X^1	1	774.26471	774.26471	2.59
RESIDUAL	6	1794.35404	299.05901	

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	19.16567	.191656703450E+02	13.94805	1.37
X^1	4.23555	.423555478323E+01	2.63235	1.61

	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	19.16567	-7.94493	46.27627
X^1	4.23555	-.88090	9.35201

E.4 Backing and Ramming: Good Correlations

M.V.Arctic: BACKING AND RAMMING CASES



****

POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES

****

--where: Dependent variable = FR AVE[mS]
Independent variable = #PL>100mS

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
#PL>100mS	7	13.85714	45.80952	6.76827	48.84321
#FR>100mS	7	26.14286	104.14286	10.20504	39.03568

CORRELATION = .946238088614

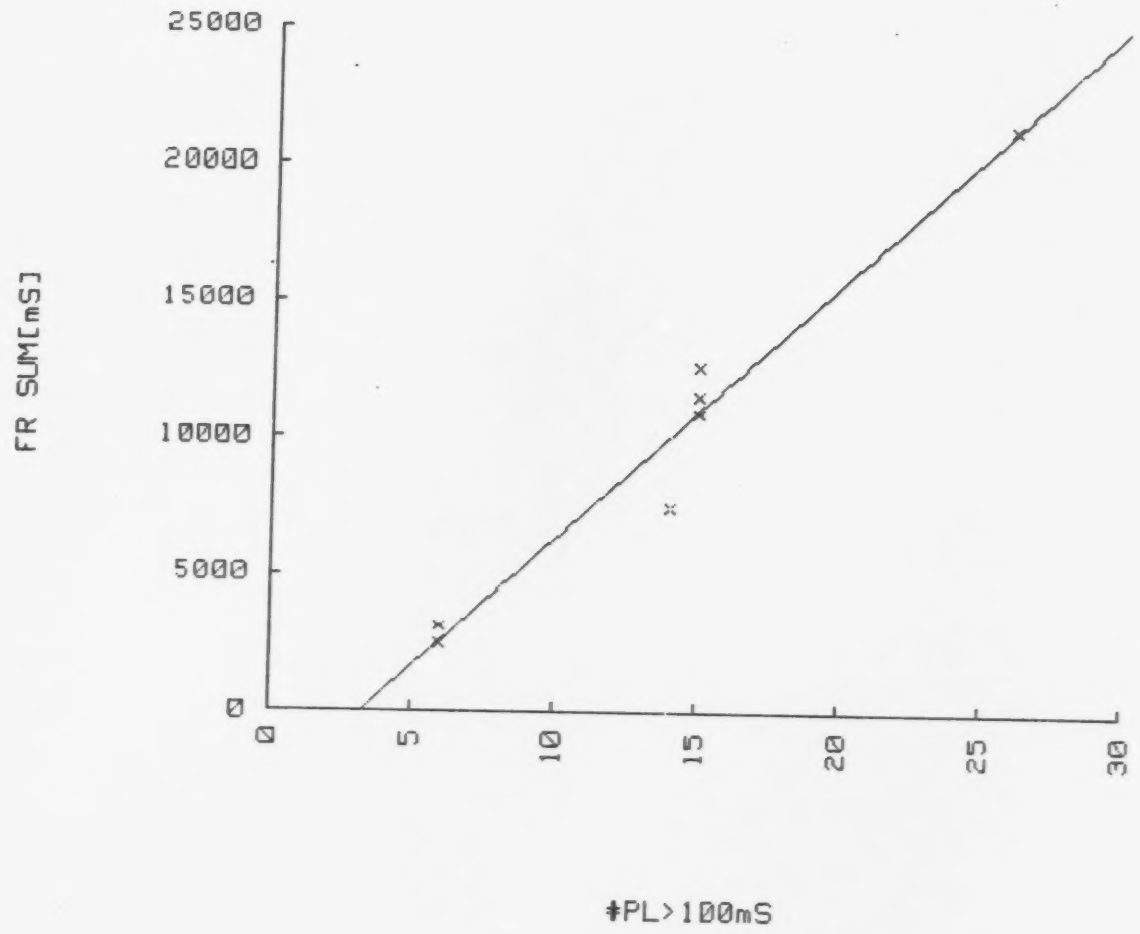
Selected degree of regression = 1
R-SQUARED = .89536652033
STANDARD ERROR OF ESTIMATE = 3.61610224285

AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	6	624.85714		
REGRESSION	1	559.47617	559.47617	42.79
X^1	1	559.47617	559.47617	42.79
RESIDUAL	5	65.38098	13.07620	

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	6.37266	.637266112350E+01	3.31712	1.92
X^1	1.42672	.142671517666E+01	.21812	6.54

	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	6.37266	-.31317	13.05850
X^1	1.42672	.98709	1.86634



****

POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES

****

--where: Dependent variable = PL MAX[mS]
Independent variable = #PL>100mS

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
#PL>100mS	7	13.85714	45.80952	6.76827	48.84321
FR SUM[mS]	7	9899.14286			

41509406.4762 M7D.5D
6442.77941 65.08421

CORRELATION = .97969029809

Selected degree of regression = 1
R-SQUARED = .959793080095
STANDARD ERROR OF ESTIMATE = 1415.18848843

ANOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	6			

249056438.857 M7D.5D

REGRESSION	1			

239042646.568 M7D.5D

239042646.568 M7D.5D
119.36

X^1	1			

239042646.568 M7D.5D

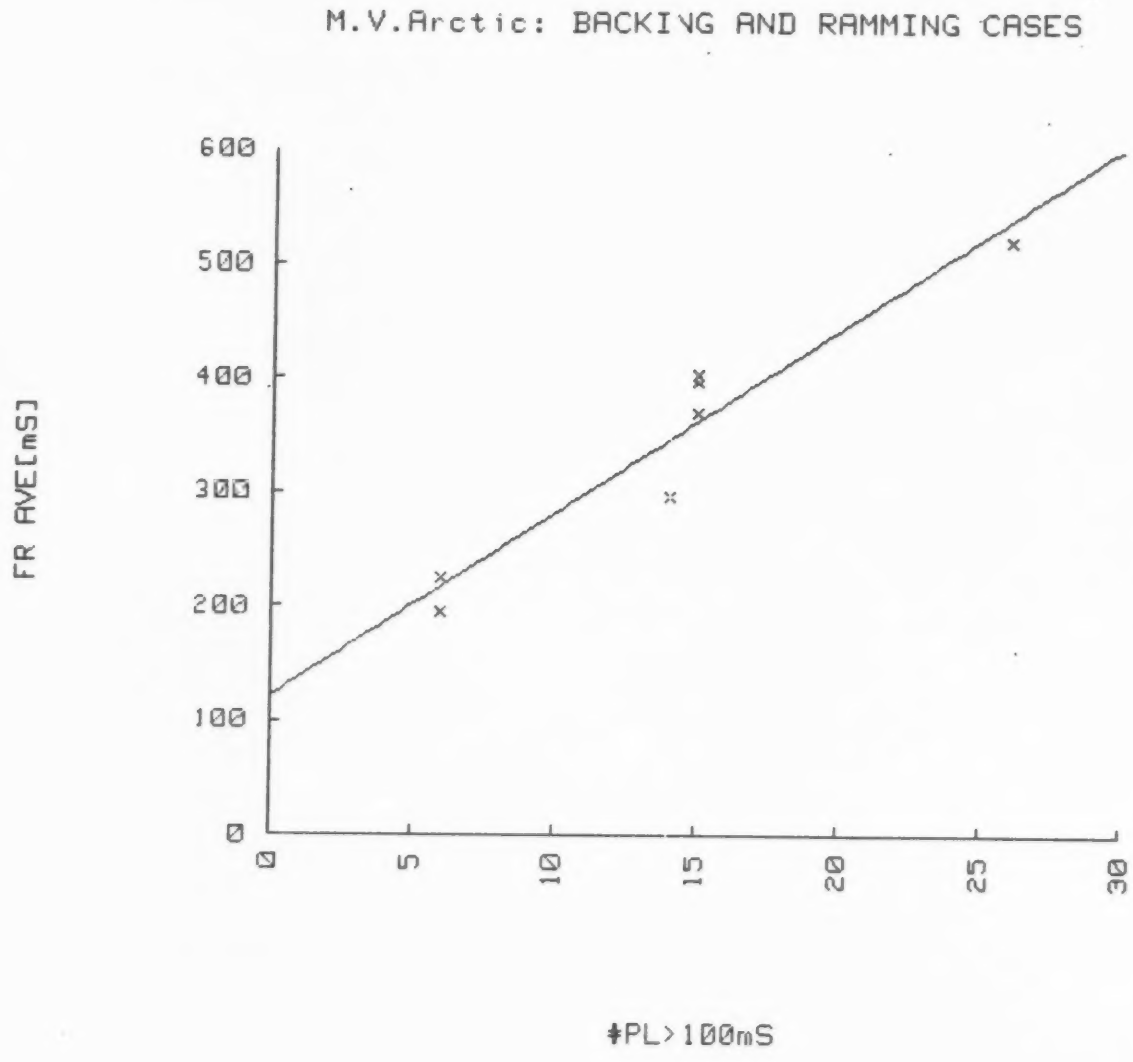
239042646.568 M7D.5D
119.36

RESIDUAL	5			

10013792.289 M7D.5D
2002758.45780

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	-3023.69439	-.302369438620E+04	1298.18079	-2.33
X^1	932.57588	.932575883542E+03	85.36125	10.93

		90 % CONFIDENCE INTERVAL	
	COEFFICIENT	LOWER LIMIT	UPPER LIMIT
'CONSTANT'	-3023.69439	-5640.24552	-407.14325
X^1	932.57588	760.52583	1104.62594


M.V.Arctic: BACKING AND RAMMING CASES
FR AVE[mS]
600
500
400
300
200
100
0
0
5
10
15
20
25
30
#PL>100mS

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
#PL>100mS	7	13.85714	45.80952	6.76827	48.84321
FR AVE[mS]	7	343.14286	12830.80952	113.27316	33.01050

CORRELATION = .95807820443

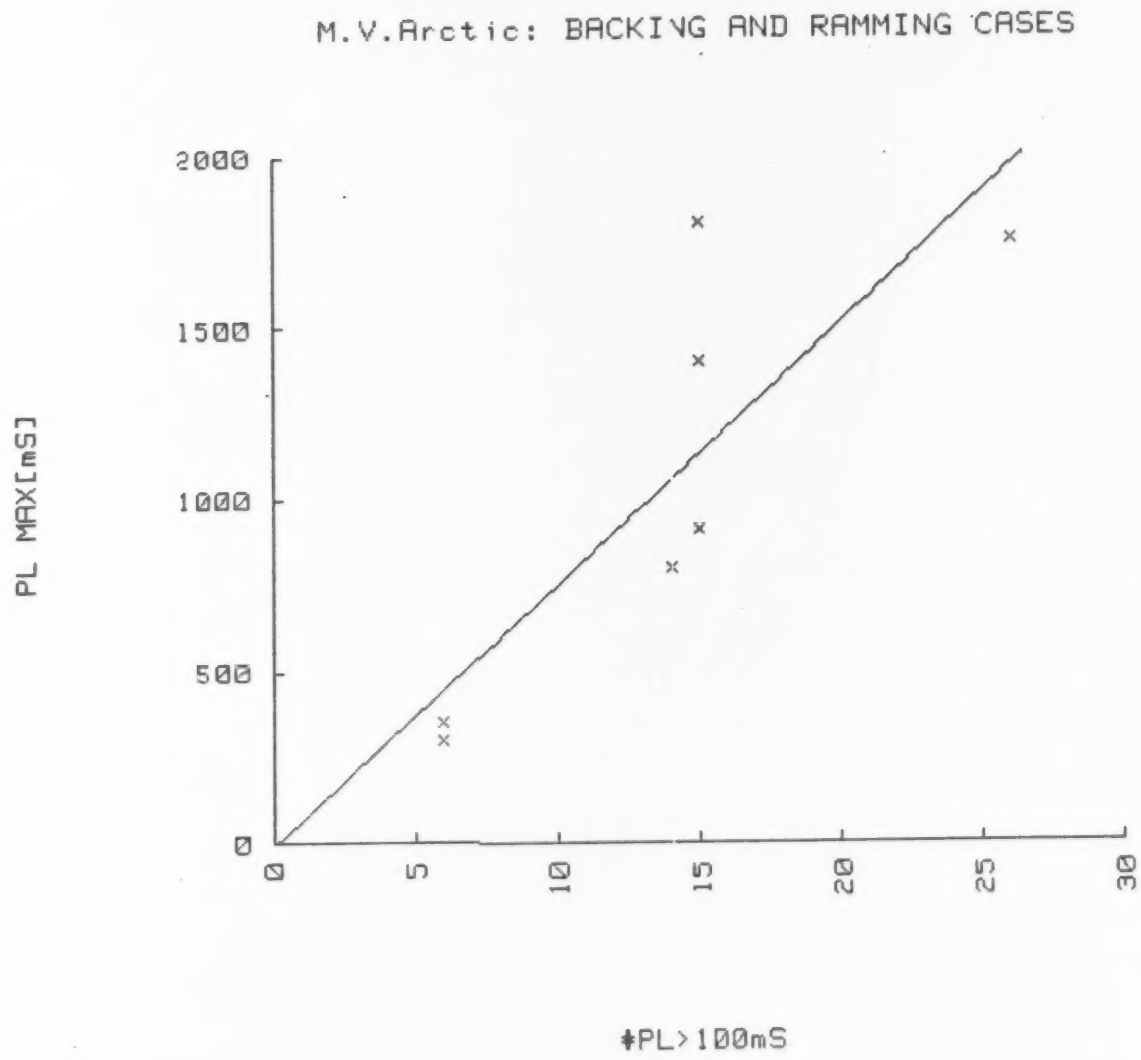
Selected degree of regression = 1
R-SQUARED = .917913845799
STANDARD ERROR OF ESTIMATE = 35.5510642726

AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	6	76984.85714		
REGRESSION	1	70665.46629	70665.46629	55.91
X^1	1	70665.46629	70665.46629	55.91
RESIDUAL	5	6319.39085	1263.87817	

VARIABLE	REGRESSION COEFFICIENTS STD. FORMAT	E-FORMAT	STANDARD ERROR REG. COEFFICIENT	T-VALUE
'CONSTANT'	120.95322	.120953222463E+03	32.61170	3.71
X^1	16.03430	.160343035336E+02	2.14437	7.48

	COEFFICIENT	90 % CONFIDENCE INTERVAL LOWER LIMIT	UPPER LIMIT
'CONSTANT'	120.95322	55.22263	186.68381
X^1	16.03430	11.71222	20.35639


M.V.Arctic: BACKING AND RAMMING CASES
PL MAX[mS]
2000
1500
1000
500
0
0
5
10
15
20
25
30
#PL>100mS

VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
#PL>100mS	7	13.85714	45.80952	6.76827	48.84321
PL MAX[mS]	7	1045.57143	385683.95238	621.03458	59.39667

CORRELATION = .831268005123

Selected degree of regression = 1
R-SQUARED = .691006496293
STANDARD ERROR OF ESTIMATE = 378.164782765

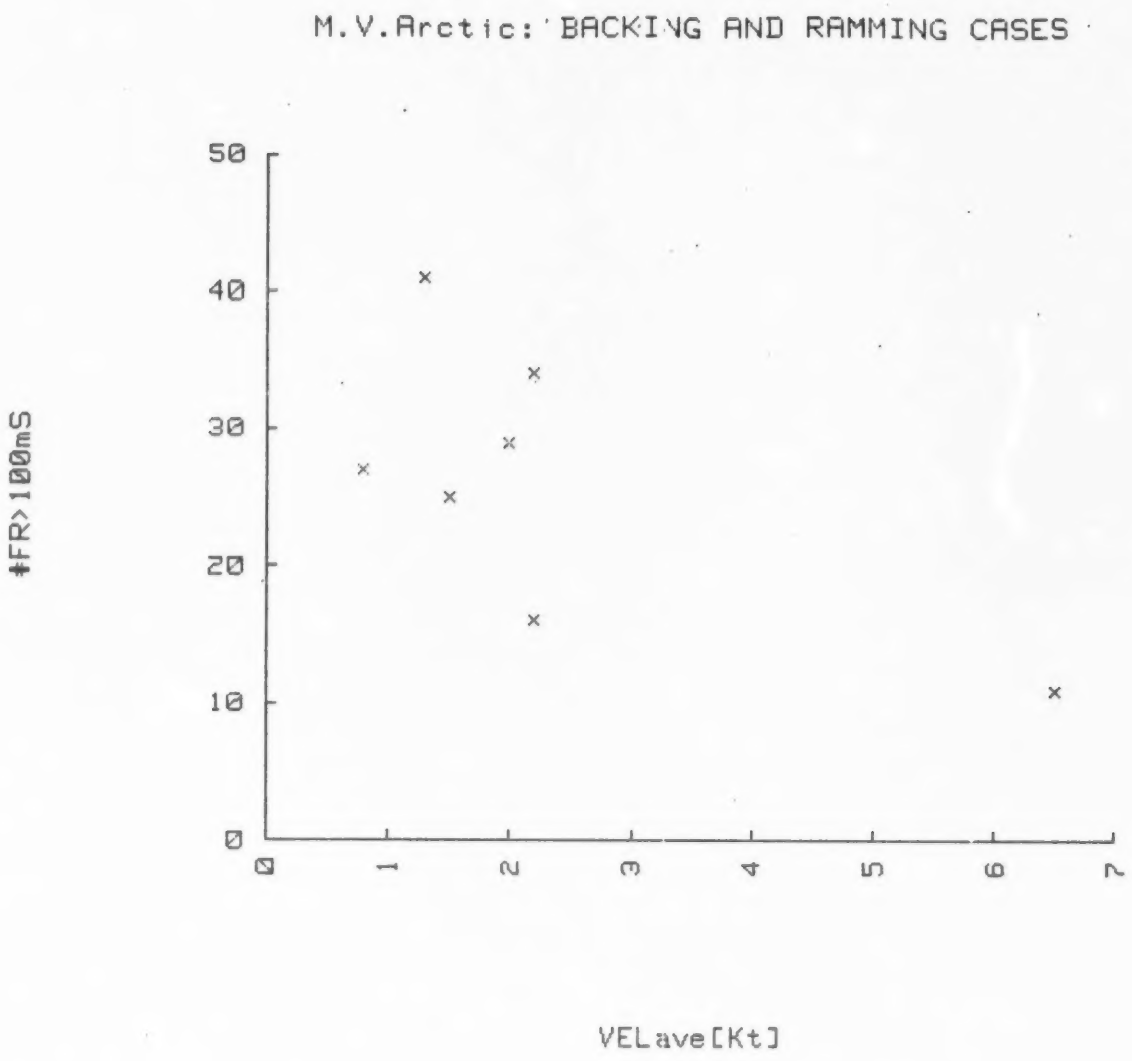
AOV

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F-VALUE
TOTAL	6	2314103.71429		
REGRESSION	1	1599060.69967	1599060.69967	11.18
X^1	1	1599060.69964	1599060.69964	11.18
RESIDUAL	5	715043.01462	143008.60292	

	REGRESSION COEFFICIENTS		STANDARD ERROR	
VARIABLE	STD. FORMAT	E-FORMAT	REG. COEFFICIENT	T-VALUE
'CONSTANT'	-11.37422	-.113742203300E+02	346.89814	-.03
X^1	76.27443	.762744282718E+02	22.81012	3.34

		90 % CONFIDENCE INTERVAL	
	COEFFICIENT	LOWER LIMIT	UPPER LIMIT
'CONSTANT'	-11.37422	-710.56553	687.81709
X^1	76.27443	30.29944	122.24942

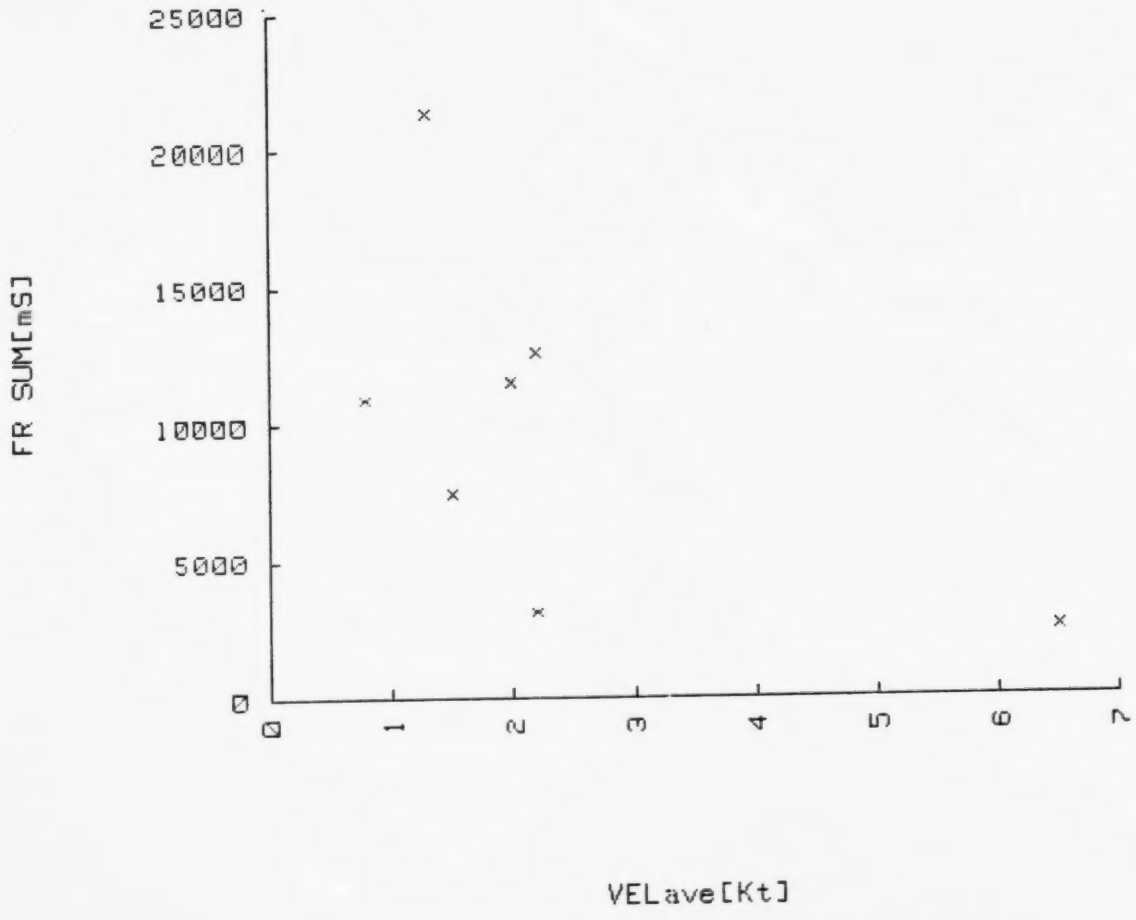
E.5 Backing and Ramming: Poor Correlations


M.V.Arctic: BACKING AND RAMMING CASES
#FR>100mS
50
40
30
20
10
0
0
1
2
3
4
5
6
7
VELave[Kt]

****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES
****

--where: Dependent variable = FR SUM[mS]
Independent variable = VELave[Kt]

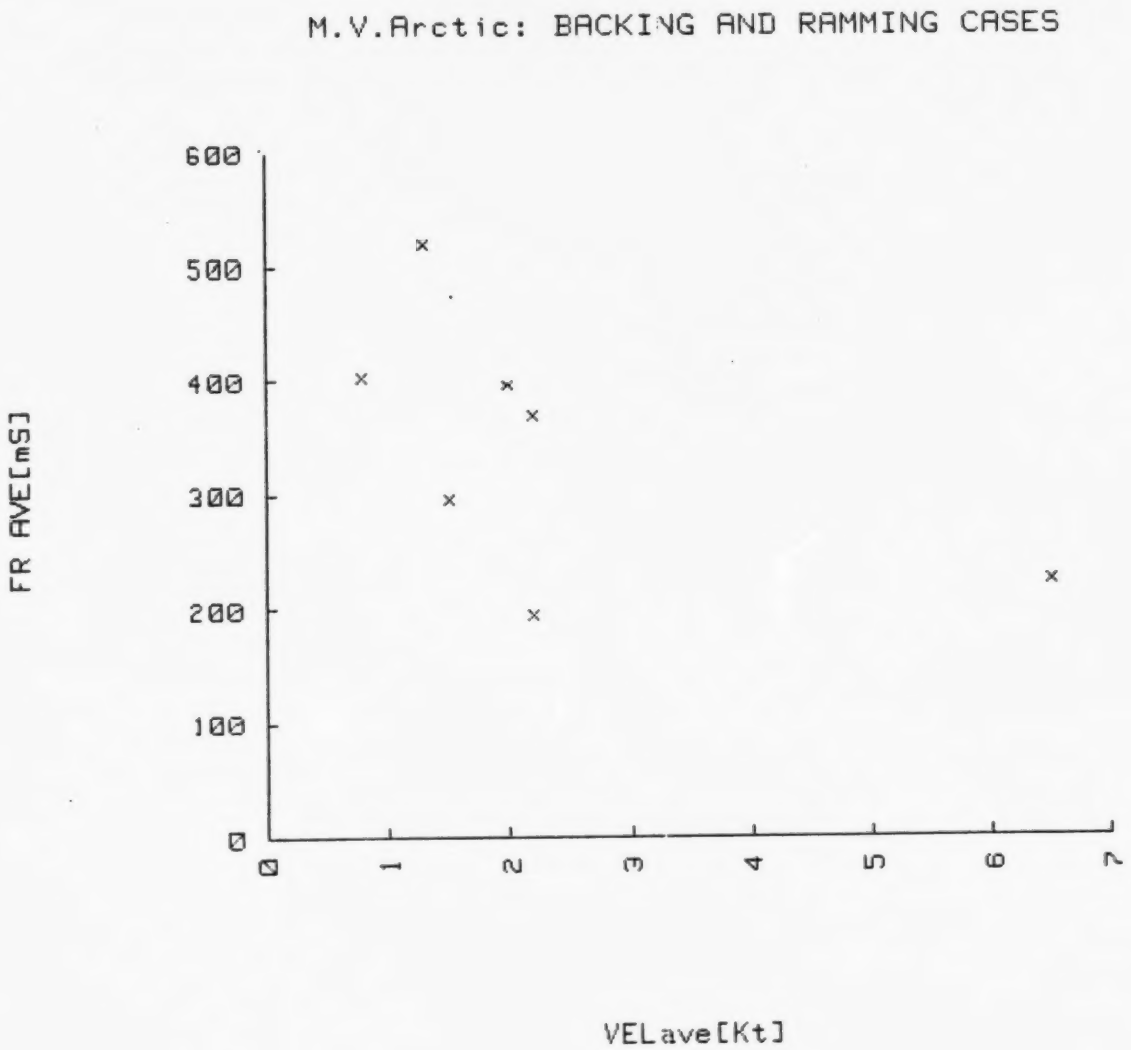
M.V.Arctic: BACKING AND RAMMING CASES



VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
VELave[Kt]	7	2.35714	3.60286	1.89812	80.52628

****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES
****

--where: Dependent variable = FR AVE[mS]
Independent variable = VELave[Kt]



VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
VELave[Kt]	7	2.35714	3.60286	1.89812	80.52628

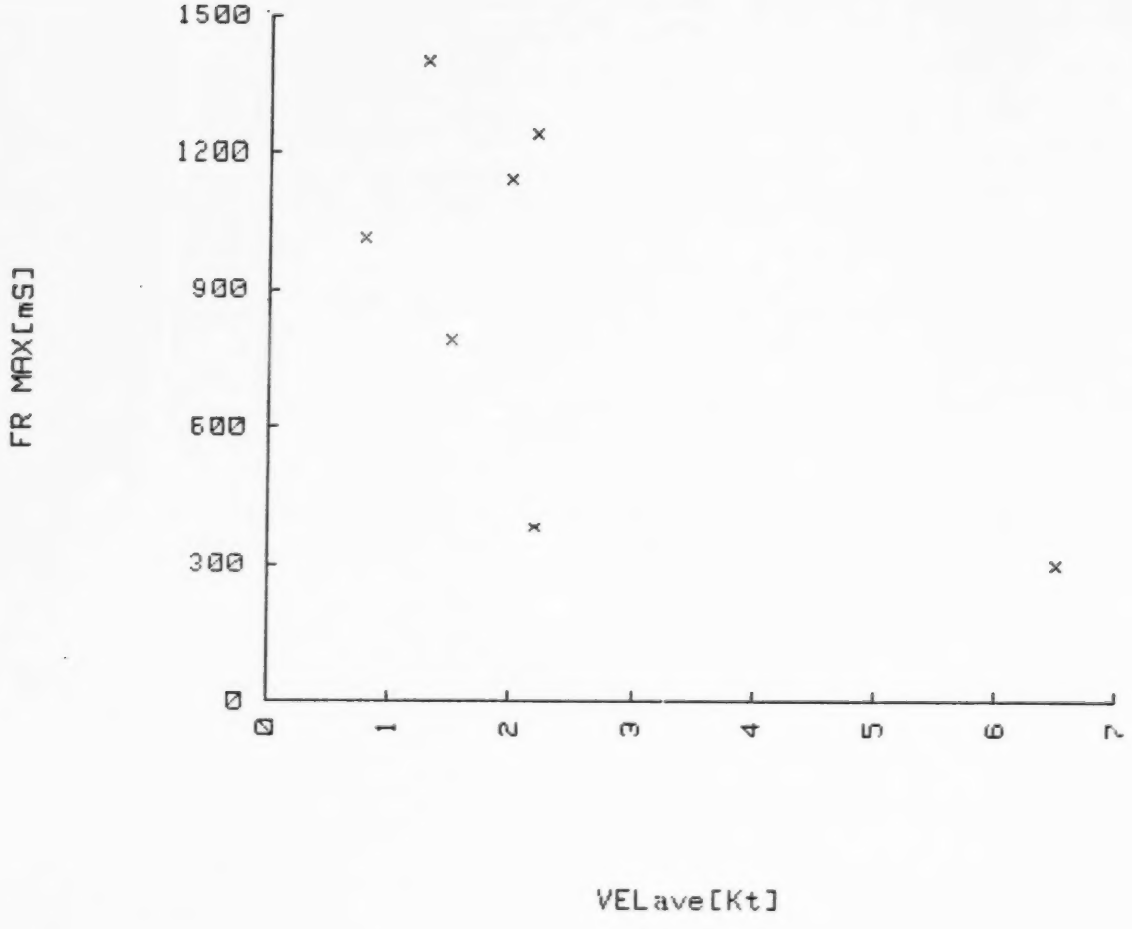
****

POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES

****

--where: Dependent variable = FR MAX[mS]
Independent variable = VELave[Kt]

M.V.Arctic: BACKING AND RAMMING CASES



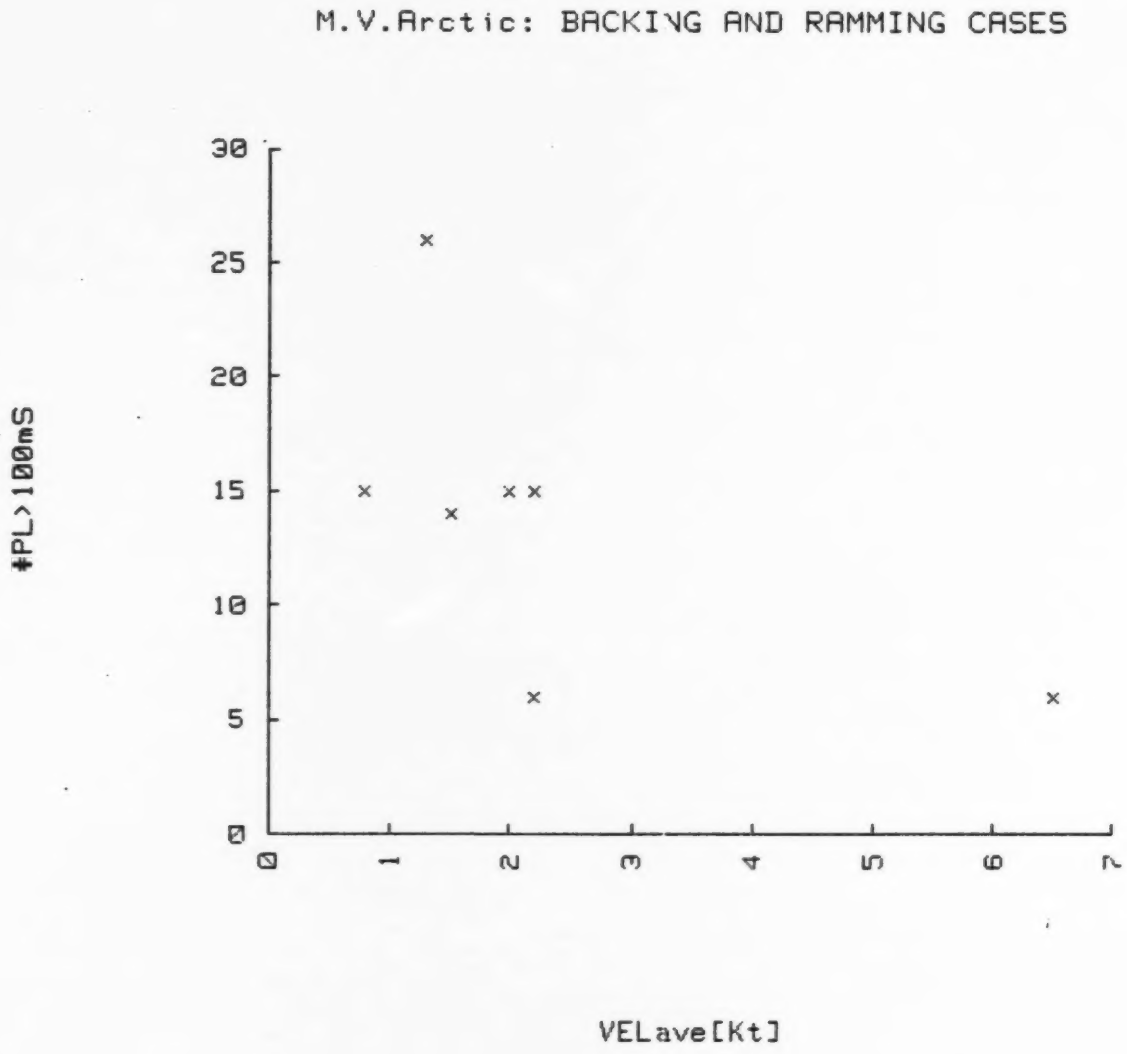
VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
VELave[Kt]	7	2.35714	3.60286	1.89812	80.52628

****

POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES

****

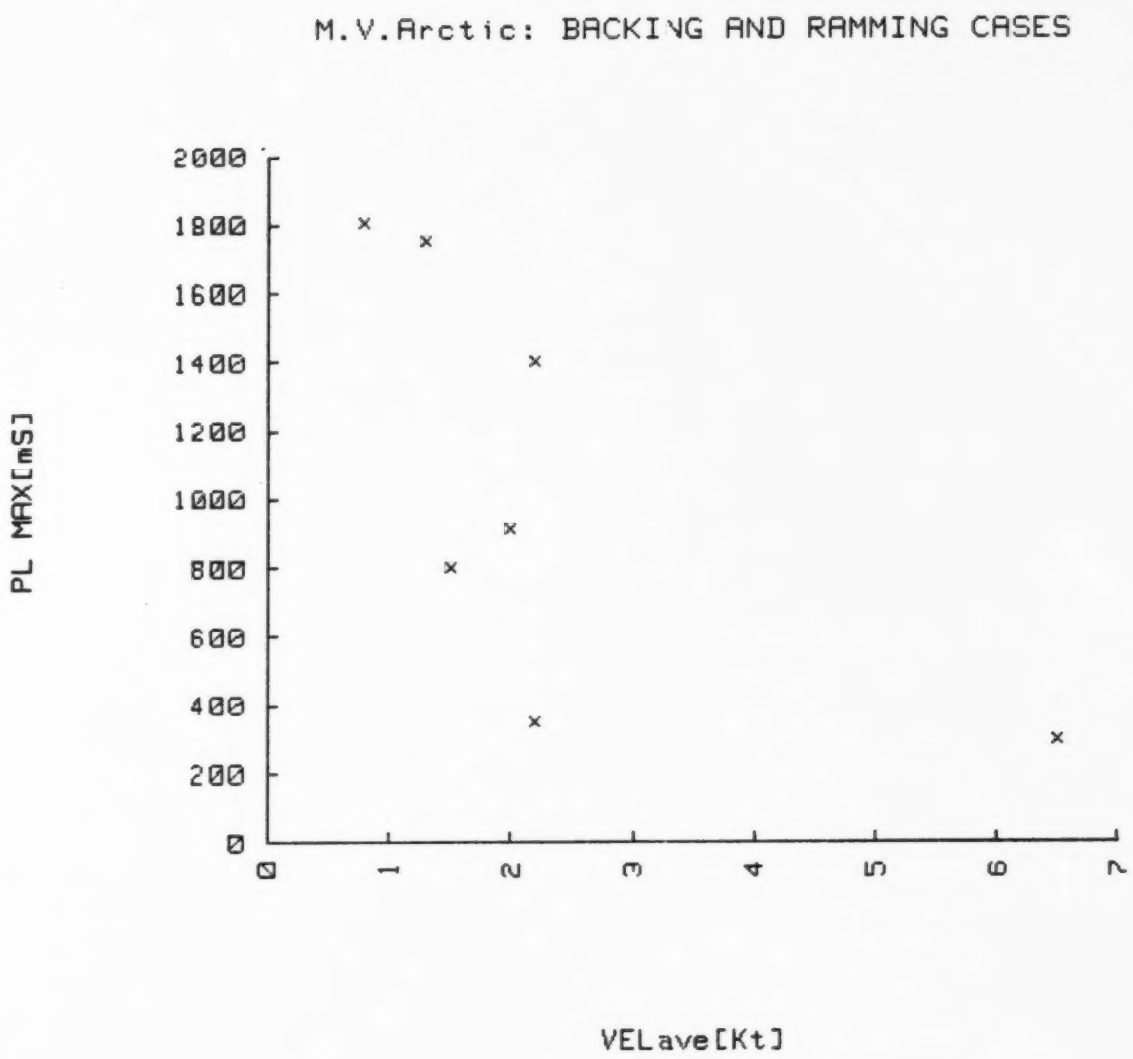
--where: Dependent variable = #PL>100mS
Independent variable = VELave[Kt]



VARIABLE	N	MEAN	VARIANCE	STANDARD DEVIATION	COEFFICIENT OF VARIATION
VELave[Kt]	7	2.35714	3.60286	1.89812	80.52628

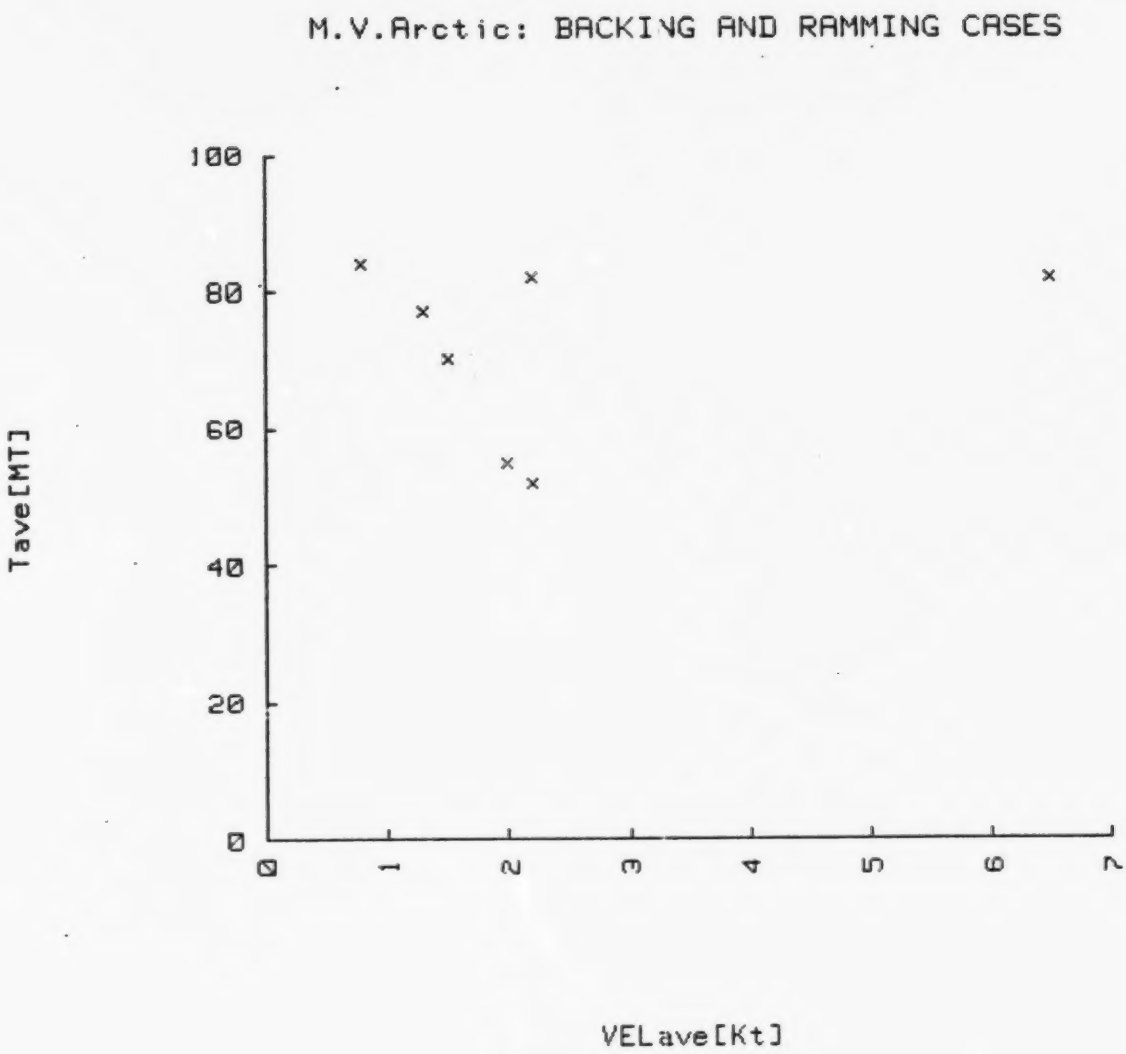
****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES
****

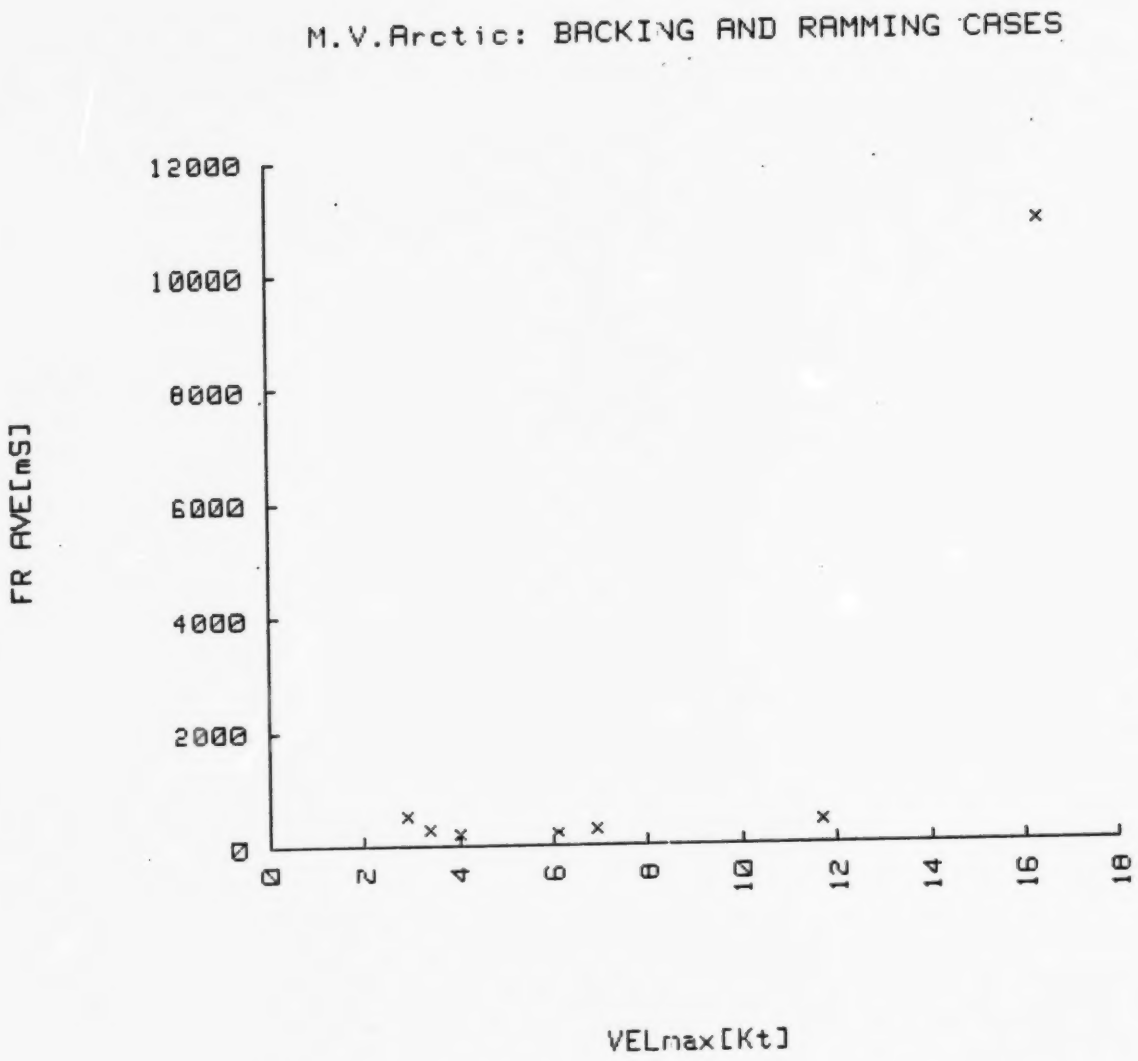
--where: Dependent variable = PL MAX[mS]
Independent variable = VELave[Kt]



****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES
****

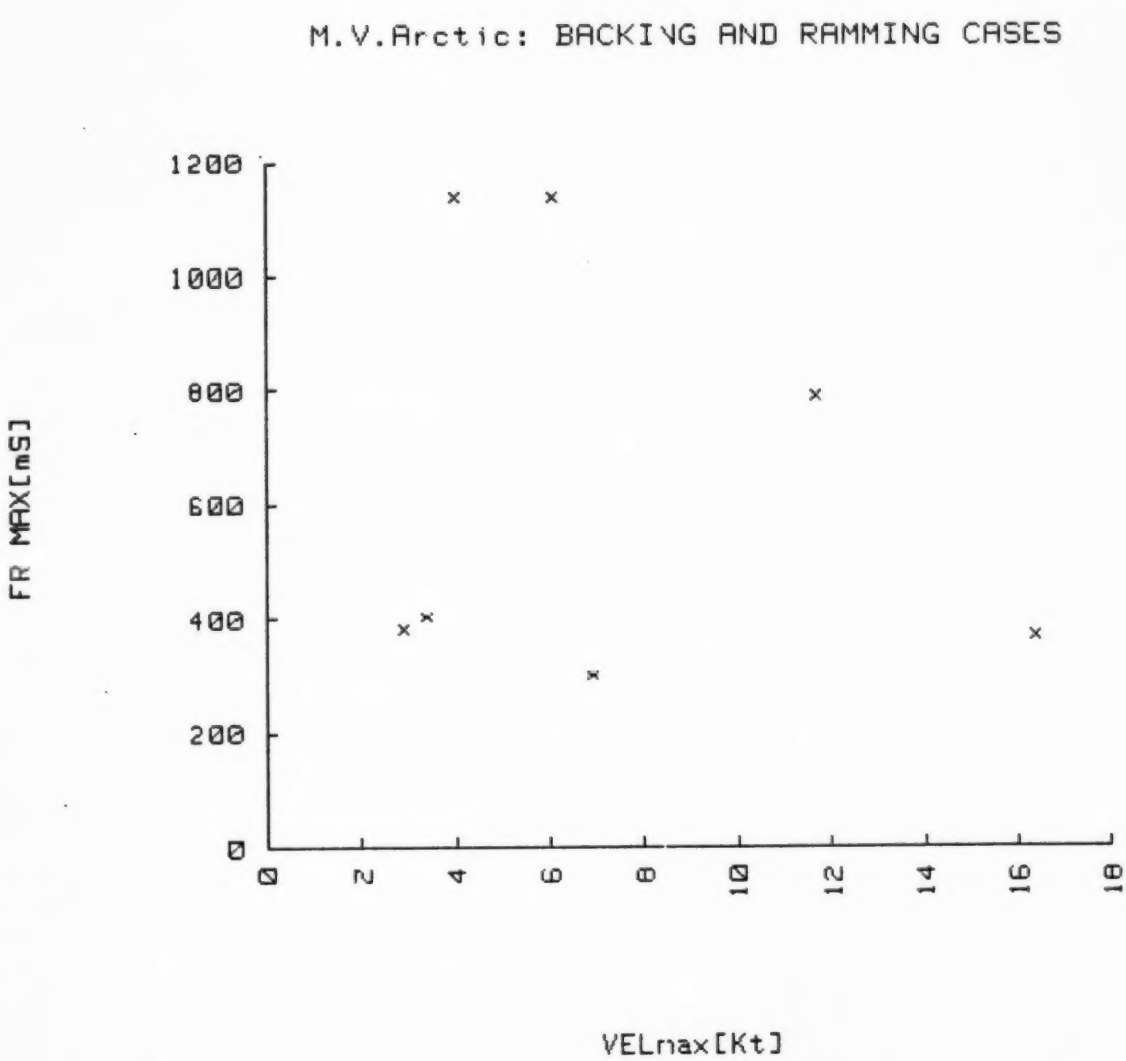
--where: Dependent variable = Tave[MT]
Independent variable = VELave[Kt]



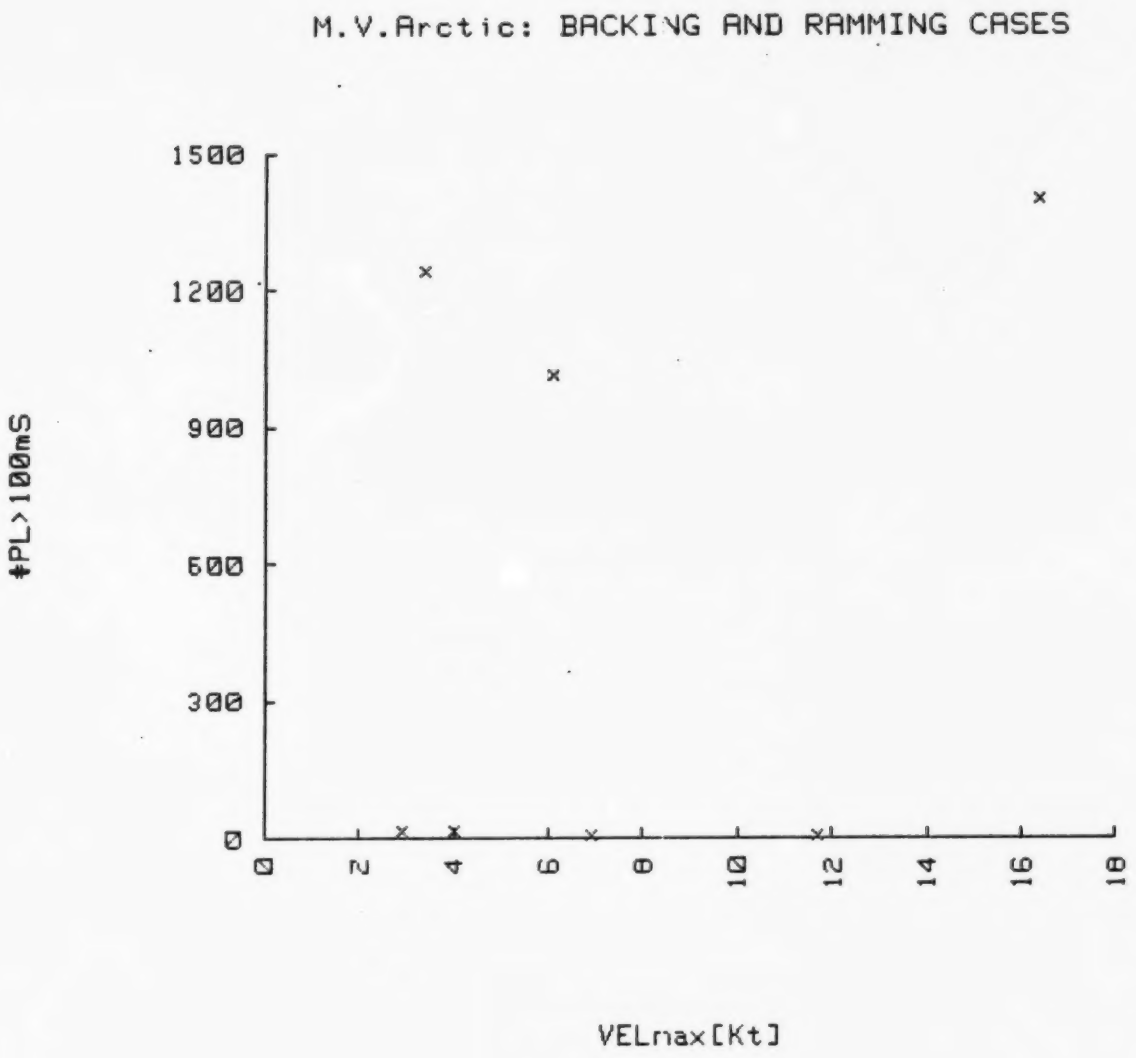

M.V.Arctic: BACKING AND RAMMING CASES
FR AVE[mS]
12000
10000
8000
6000
4000
2000
0
0
2
4
6
8
10
12
14
16
18
VELmax[Kt]

****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES
****

--where: Dependent variable = FR MAX[mS]
Independent variable = VELmax[Kt]

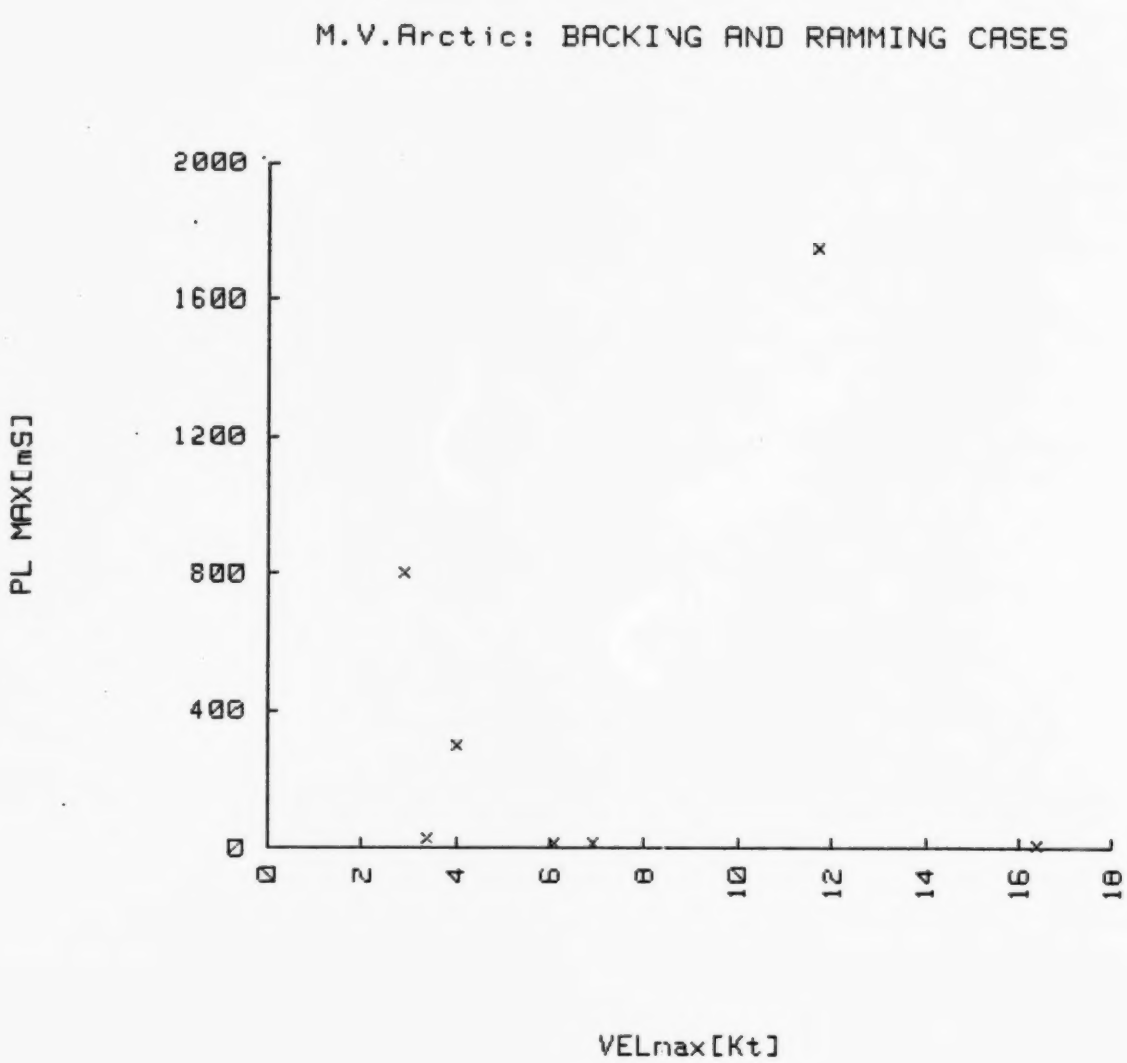


--where: Dependent variable = #PL>100mS
Independent variable = VELmax[Kt]



****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES
****

--where: Dependent variable = PL MAX[mS]
Independent variable = VELmax[Kt]



****
POLYNOMIAL REGRESSION ON DATA SET:
M.V.Arctic: BACKING AND RAMMING CASES
****

APPENDIX F

OPERATORS TROUBLESHOOTING GUIDE

INTRODUCTION.....1

PART 1 - FAULT FINDING.....2

PART 2 - GENERAL MAINTENANCE GUIDE.....5

1. INTRODUCTION

When a fault occurs in the data acquisition system, it becomes evident in one of many system components first. In many cases this first clue that something is amiss occurs in a component that is far removed from the component at fault. In these cases we first see a symptom of the fault and then, after trouble shooting the system, we come across the origin of the fault. With the origin of the fault identified the problem is easily cured provided replacement parts are available. The following trouble shooting guide identifies symptoms of a fault, guides the operator to the unit that caused this symptom and describes the action required to cure the fault. The guide is based on trouble shooting techniques developed by two operators during half of the 1981 operating season.

The guide is formatted in two parts. In the first part, the symptom/fault/cure guide is provided. This is divided into sections lettered A through G as follows:

A - Tapedrives
B - Interface Modules
C - Transducers
D - Computer
E - Terminal
F - Master Cards
G - Amplifier Cards

Part two is a general maintenance guide providing the operator with recommended schedules and techniques for preventative system maintenance. This is sub-divided into sections denoted by GM.

PART 1 - FAULT FINDING

SYMPTOM	FAULT/ACTION
A. Tape Drives	
(1) Tape drive looses vaccum, vacuum pump shuts down.	(1) See GM.3
(2) Starting up drive results in tangled tape with no vacuum.	(2) See GM.3
(3) Drive stops moving during data acquisitions (accompanied by computer crash) but vacuum stays up.	(3) See D.1
B. Interface Modules	
(1) Invalid data light flashes on and off and latches alarm on.	(1.a) Faulty relay in one or more boxes. b) Power supply off in a box, maybe faulty key switch.
(2) Significant difference between PEAK and REAL mode oscilloscope traces from A/D test point with continuous scan test program. Typically PEAK trace different level than REAL trace with large rising and falling edge spikes.	(2) See GM.1 (and illustration)
C. Transducers	
(1) *Strain Gauges*	
(a) No longer able to balance gauge, typically amplifier saturated at + 12 V dc.	(1.a) Modify coarse balance controls by inserting a 10K Ω resistor across R55.
(b) Strain gauge drifts into amplifier saturation daily	(1.b) Gauge is most likely wet and will continue to drift erratically until the ship's ballast is altered and the gauge is allowed to dry out.
(c) Unable to balance gauge dispite extended balance modifications of C.1a.	(1.c) Damaged gauge;may recover at a later date if a moisture problem.

(2) *Roll/Pitch Gyro*

(a) Noisy signal especially at one roll or pitch angle

(2.a) Faulty potentiometer with crack or dirt on resistive element - clean with contact spray

(3) *Accelerometers*

(a) Output drifts extensively.

(3.a) Check transducer by switching amplifier cards from another accelerometer - if drift stays with suspect transducer, replace accelerometer.

D. Computer

(1) Run light goes out (computer crash)

(1.a) Sampling rate and pattern incompatible with computer, reduce sampling rate.

(1.b) Noise on computer interface, specifically, driver module #2: - check for improperly terminated logic lines (design flaw) - see GM.2.

(2) Computer main frame over heating.

(2) Clean fans, open porthole to keep lab below 70°F.

(3) Computer logs all gauge channels at approximately -250 micro strain or logs all channels in one bin at -250 micro strains.

(3) Master cards not being addressed (sampling bus level of 4.53 volts) - See F.2.

E. Terminal

(1) "End of paper" fault does not clear after paper refilled.

(1) Turn terminal off then back on with power switch.

F. Master Cards

(1) Card tests okay in lab but is not being addressed as evident from CE (card enable) test point remaining low.

(1) Faulty address switches on M.C. burnt out IC2: check in lab with all possible logic combinations on block address.

(2) Not all amplifier cards being addressed or amplifier cards being addressed too many times per second.	(2.a) Short in address switch area. (2.b) Burnt out IC1 or IC14. (2.c) Poor or shorted contacts on edge connectors in bin resulting in incorrect addressing - pull and re-insert card for a possible temporary fix.
G. Amplifier Cards	
(1) Card not being addressed as evident from test point CA (card addressed).	(1.a) Check Action F.2 (1.b) Check IC2 by bench testing with all card address combinations.
(2) REAL output shifts a maximum of ± 1 volt, remains stable then intermittently shifts again.	(2) Auto-zero circuit is cycling, disable circuit by tying ZC to ground on M.C. (remove IC5) or jumper reference voltage on amp card to level pot.
(3) Card addressing works in one slot but not another.	(3) See F.2.

PART 2 - GENERAL MAINTENANCE GUIDE

GM.1

All amplifier and master cards should be checked with the logic probe for correct addressing periodically. (a) Put the computer in the scope TEST mode and set it up to address all cards consecutively. Periodic pulses should be seen at amp card test point CA and master card test point EN. (b) With the TEST program addressing individual channels check for clean pulses on the analogue bus (test point on A/D unit). These wave shapes are illustrated in Figure 1. Note that both in the REAL and PEAK mode the shapes should be similar and at the same levels. If this is not the case but test points CA and EN checked okay in (a) then the logic gates controlling the analogue switch are most likely at fault (IC.3). Note also that if no amplifier card is in the addressed slot a distorted pulse is also observed.

G.M.2

In the 1981 operating season a major problem was the computer stopping while in the data acquisition mode. The problem was discovered to be primarily with the logic interface in driver module #2 where improperly terminated logic lines were picking up noise and confusing the computer causing it to crash, sometimes erasing the acquisition program. It was also discovered that, subsequent to interface modifications, the system would periodically crash if the room temperature rose above 80°F. While troubleshooting the system for the interface logic line problem a number of interesting effects were observed which may be useful in future interface problems:

(1) Removing the bus via the two multi-conductor connectors on the interface module invariably stopped the system from crashing. It is believed that the bus switching transients provided a source of noise to act on the floating logic lines causing the system to crash. Removing this noise source stopped the problem.

(2) Putting an extender card on driver module #2 also reduced the number of computer crashes by moving the module farther away from the noise source.

(3) The tape drive unit could be taken off line, shut down and hence isolated from the system without the computers acquisition program stopping. This proved that the tape drive units were not causing the computer crashes.

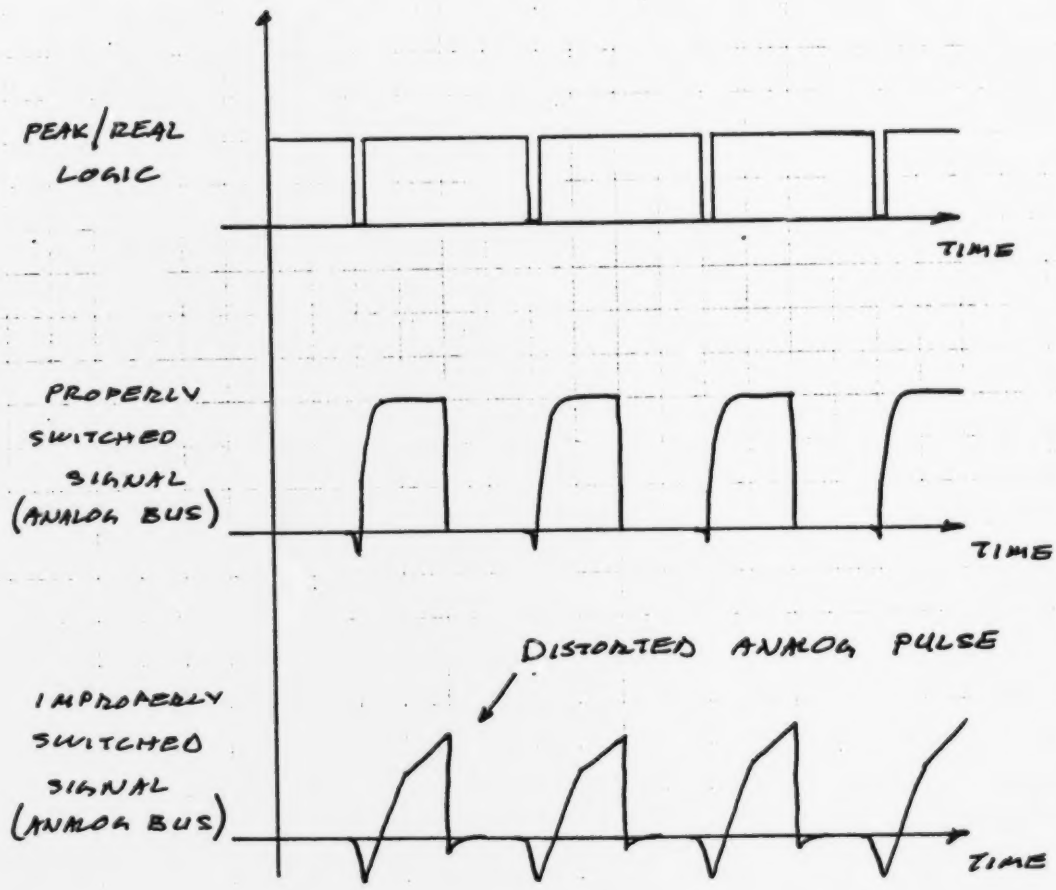


FIGURE 1 DISTORTED SWITCHING ON ANALOG BUS

(4) Adjusting the period of oscillator UG on the interface logic podule (potentiometer P1) seemed to affect the systems reliability. A setting of 35 microseconds produced the most reliable results. This setting also appeared to shift possibly due to mechanical vibration or thermal changes.

TAPE DRIVES

GM.3

The biggest enemy of the Ampex tape drives is the dust from the ore that is everywhere while loading in Nanisivik and Antwerp. As a result the units should be cleaned every day while in ice as instructed in the Ampex manual.

In addition, all hose connections should be checked for a tight fit especially the 1/4" ID clear hoses for a tight press fit.

GM.4

Note that if the Ampex tape drive #0 becomes inoperable programs can still be loaded from unit #1 by changing its address to 00 (and unit #0 to 01) in the back of the rack.

GM.5

When trouble shooting CMOS IC's beware that a logic "high" input has been known to supply sufficient supply voltage to a damaged chip to keep it operational. Obviously if that "high" logic level goes low the chip becomes inoperable.

GM.6

CMOS IC's are not fully checked unless all outputs have been shown to be capable of toggling between logic 0 and logic 1.

GM.7

CMOS logic boards should not be removed with the power supplies on nor should the logic be driven by external logic while the boards supply is off. Obviously this ideal condition is virtually impossible to achieve with the physical arrangement of the systems. Nevertheless, it is advised that, when ever feasible, the power supplies be shut down while removing cards especially while doing extensive repairs.

VIDEO

GM.8

In the 1981 fall operating season the pan-tilt T.V. camera system was non-operational due to excessive corrosion of components in the "environmental" housing. This occurred primarily because of salt water spray entering the housing through ventilation holes while in heavy seas over a period of years. A second camera was mounted in the look-out room on the fore-mast. Note also that 2 video co-ax cables were installed on the starboard side for the cameras used during the dedicated trials in November 1981. These cables may stay intact for several years and be useful as a back-up someday.